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Pay Determinants in the Malaysian Economy

Evidence from Employee, Employer, and Employer-Employee Perspectives

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PAY DETERMINANTS IN THE MALAYSIAN ECONOMY: EVIDENCE FROM EMPLOYEE, EMPLOYER, AND EMPLOYER-EMPLOYEE PERSPECTIVES

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ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
ADF	augmented Dickey-Fuller
AMS	Annual Manufacturing Survey
BERNAMA	Malaysian National News
BNM	Central Bank of Malaysia
CIAST	Centre for Instructor and Advanced Skill Training
CPI	Consumer Price Index
DOSM	Department of Statistics Malaysia
ECM	Error Correction Model
EOI	Export-Orientation Industrialization
EPU	Economic Planning Unit
ES	Enterprise Survey
FDI	Foreign Direct Investment
FE	Fixed Effect
FLD	Firm-Level Dataset
FTD	Female Treatment Disadvantage
GDP	Gross Domestic Product
GMI	German-Malaysian Institute
HIS	Household Income Survey
HRDF	Human Resources Development Fund
IKMs	Mara Skills Institute
ITIs	Information Technology Industry
IV	Instrumental Variable
KPSS	Kwiatkowski–Phillips–Schmidt–Shin
LSDV	Least Squares Dummy Variable
MCL	Marginal Cost of Labour
MEED	Matched Employer-Employer Dataset
MFLS-2	the Second Malaysian Family Life Survey
MIDA	Malaysian Industrial Development Authority
MOF	Ministry of Finance
MPC	Malaysian Productivity Council
MRPL	Marginal Revenue Product of Labour
MTA	Male Treatment Advantage
MWFD	Matched Worker-Firm Dataset
NEAC	National Economic Advisory Council
NLAC	National Labour Advisory Council
NPC	National Productivity Corporation
OLS	Ordinary Least Squares
PICS-1	the First Malaysian Productivity Investment Climate Survey
PICS-2	the Second Malaysian Productivity Investment Climate Survey
PLWS	Productivity-Linked Wage System
PP	Phillips-Perron
QR	Quantile Regression
RE	Random Effect
SDCs	Standards Development Committee
SE	Standard Error
SIRIM	Scientific and Industrial Research Institute of Malaysia
SITC	Standard International Trade Classification
SME	Small Medium Enterprise
VECM	Vector Error Correction Model
VIF	Variance Inflation Factor
WLD	Worker-Level Dataset

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Declaration

I declare that I am the author of this thesis and I have consulted all the references cited. All the work of which this thesis is a record has been done by me and has not been previously accepted for a higher degree. All the tables of results and figures, unless otherwise stated, are the outcome of my own calculations.

Signed

Normala Zulkifli, PhD Candidate

Date: 30th July 2016

Certification

I certify that Mrs. Normala Zulkifli conducted this research under my supervision in the Department of Economic Studies, University of Dundee. Mrs. Normala Zulkifli has fulfilled all the conditions of the relevant Ordinances and Regulations of the University of Dundee for obtaining the Degree of Doctor of Philosophy.

Professor Monojit Chatterji

1st Supervisor

Date…………….

Signature…………………

Abstract

The objective of the thesis is to investigate Malaysia's pay determinants from three different perspectives, namely: employees' perspective, employers' perspective, and both employees-employers' perspectives. As a matter of fact, previous studies have not been able to document the potential impact of employers and firms on pay determinants within the Malaysian economy, owing to a lack of appropriate data. Therefore, with the availability of new datasets – worker-level dataset (WLD) and firm-level dataset (FLD) obtained from the Second Malaysian Productivity Investment Climate Survey (PICS-2), we have developed a matched-worker-firm dataset (MWFD), so that by employing such dataset it will add a new dimension to pay analysis in Malaysia as well as allowing for a comprehensive understanding and clearer picture of Malaysia's pay system.

From the employees' prospective, the findings of this thesis indicate that a worker with a higher education level, skills and training generally gets a higher pay compared to those without. In addition, a worker who undergoes training from his/her current employer gets a higher pay compared to those who had training from a previous employer or only off-the-job training. At the same time, workers with complex computer skills, as well as those who are in professional employment and management, also receive a considerably higher pay. From the employers' prospective, however, the findings indicate that firm size, human capital stock in the firm, worker performance, capital stock, and firm performance are important factors that affect the Malaysian average monthly pay. Besides, the elasticity of pay with

respect to employer size is two percent, and this figure supports the notion that the Malaysian labour market can be characterised as imperfect competition. From both employers-employees' prospective, it is obvious that both observable worker characteristics and unobserved firm-effects are key elements of pay determinants. Nevertheless, firm effects seem to explain the variability in pay determinants more than observable worker characteristics. In addition, the relationship between pay component and firm performance exhibits a positive tendency. This implies that workers get a higher pay either because of worker characteristics or that firm-effects are being employed in firms that are more productive and profitability.

CHAPTER 1 : INTRODUCTION AND OVERVIEW

1.1 Preliminary

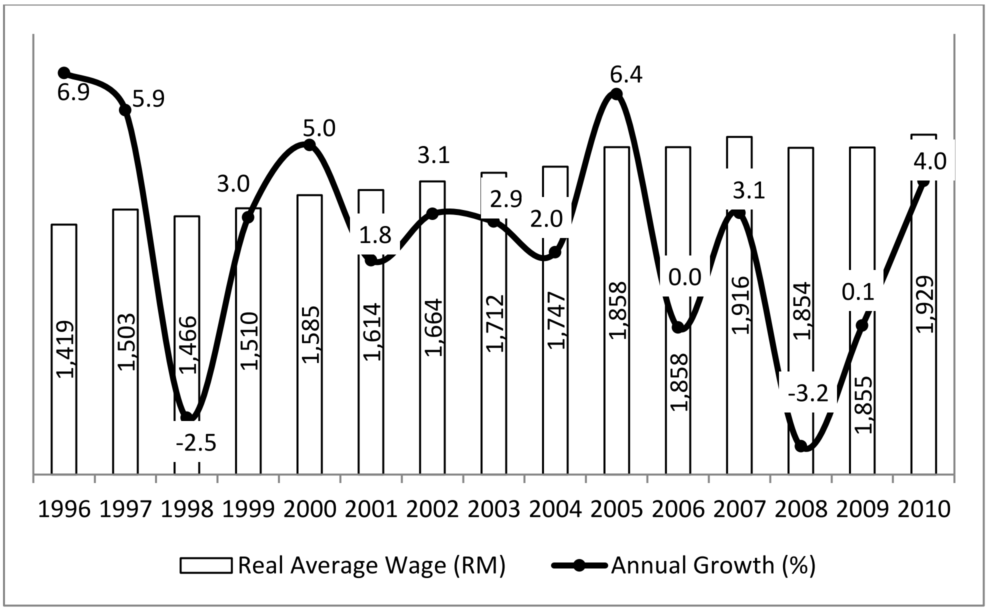
This chapter introduces the research background and motivation of the study, before setting out the aims and research questions. The chapter then discusses the contributions of the thesis, followed by a look at the research design. Finally, the structure of the thesis is outlined.

1.2 Research background

In the labour market, pay or wage rate is by far the most important and contentious issue that concerns government, employers, and workers. For the government, pay is important because generally it affects the stability of national macroeconomic indicators such as inflation, employment, purchasing power and socio-economic development. For the employers, however, pay is deemed important as it represents a significant part of their costs, a factor that has become increasingly important to their workers' performance and competitiveness in general. In this manner, pay affects the employers' ability to retain and recruit a labour force of quality. Meanwhile, for workers, pay is the most important issue as it measures the value of their services, becoming consequently a fundamental indicator of the workers' standard of living.

In recent decades, rapid economic growth in Malaysia has been deemed over time as fundamental towards improvement in the standard of living. This is because the more prosperous a country is, the better off are its citizens in terms of wealth and health. But did Malaysia's economic growth lead to an improvement in its standard of living? In general, we reckon that a higher economic growth, achieved through more productive use of all available resources, should result in a higher per capita income, and hence improvement in people's average standard of living (measured in terms of the average wage). The average wage represents the general wage level in the country. Figure 1.1 illustrates the average monthly real wages (defined as the mean of the monthly gross nominal wages of employees in the Malaysian manufacturing sector, deflated by CPI [2005=100]) and annual growth rates from 1996 to 2010.

Figure 1.1: Average Monthly Real Wages and Annual Growth Rate in Malaysia (Manufacturing), 1996-2010



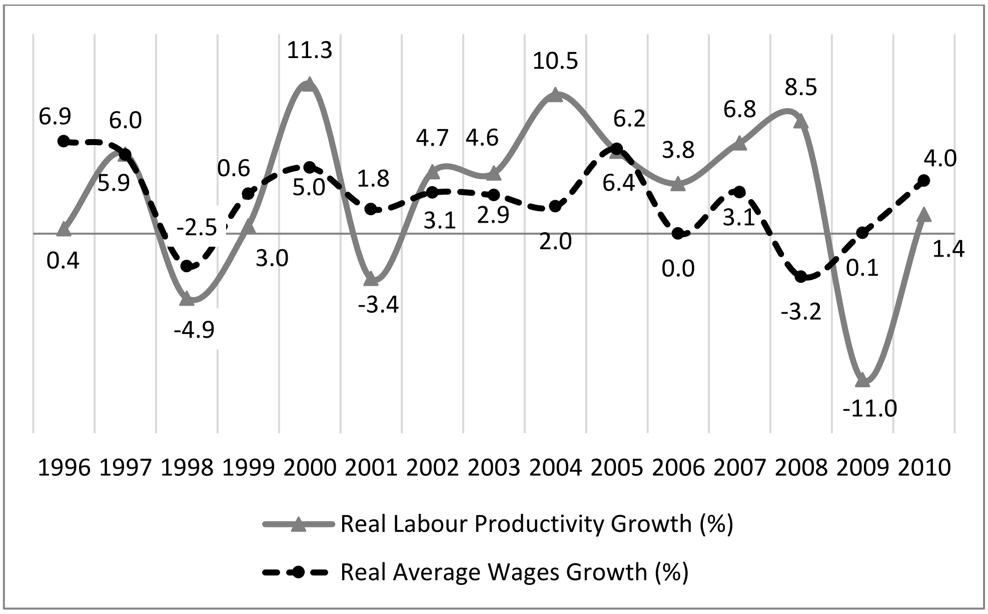
Notes: Total monthly wages are divided by total employment. Real monthly average wage is calculated in constant 2005 Ringgit Malaysia.

Sources: *Monthly Manufacturing Survey, Department of Statistics of Malaysia* ***(****Nominal monthly average wage); International Monetary Fund (Consumer Price Index).*

Based on Figure 1.1, the average monthly real wages for Malaysian manufacturing increased only at about 36 percent in fifteen years. In 1996, the average worker earned RM 1,419 per month in real terms, while it was RM 1,929 per month in 2010. High inflation in 1998 and 2008 nullified some of the gains and caused the real average wage to fall for those two years by 2.5 and 3.2 percent, respectively. In 2001 to 2004, real wages rose more sedately. Real wage growth picked up pace in 2005, but continuously grew at a decelerating path from 2006 to 2008. In 2008, given the economic recession and the ensuing inflationary pressures, real growth in average monthly wages turned out to be negative. With the gradual recovery of the economy from the global financial crisis, wage growth started to grow by 4 percent in 2010.

But who actually benefits from such economic growth? The government has long acknowledged that growth does not automatically benefit all members of society during economic expansion due to its strategies of providing support to the most vulnerable and reducing poverty (Bailey et al., 2011). Nonetheless, we expect that people at work can directly enjoy the positive impact of such monthly growth through their pay. Figure 1.2 shows the link between pay (measured in terms of average monthly real wages) and economic growth (measured in terms of real labour productivity) in the Malaysian manufacturing sector between 1996 and 2010. Real labour productivity is defined as real GDP per employed person in constant 2005 Ringgit Malaysia.

Figure 1.2: Real Average Wage Growth vs. Real Labour Productivity Growth in Malaysian Manufacturing, 1996-2010



Notes: Real labour productivity is calculated as real GDP in constant 2005 Ringgit Malaysia, divided by the total employment. Average monthly real wages are in constant 2005 Ringgit Malaysia. Wage data only cover the manufacturing sector.

Sources: *Department of Statistics of Malaysia, Monthly Survey of Manufacturing* **(***nominal monthly average wage); National Accounts (GDP and total employment); International Monetary Fund (Consumer Price Index).*

As shown in Figure 1.2, in just about every year, wage growth moved in the same direction as labour productivity growth, as predicted by the positive labour productivity-wage growth hypothesis. In other words, when the growth rate of labour productivity increased, wage growth accelerated; and when the growth rate of labour productivity decreased, wage growth decelerated. However, in the years 2001, 2008, and 2009, the relationship between the two becomes negative. For the years 2001 and 2009, the real wage growth increased despite declining real labour productivity growth due to inflation being lower than the nominal wage growth. Meanwhile, in 2008, a higher inflation (5.4%) relative to the nominal wage growth (2.0%) caused the real wage growth to decrease despite gains in labour productivity. While real wage growth and real labour productivity tend to move together, the growth in real wage has mostly been falling behind improvements in real labour productivity (2002-2007). In addition, real wage growth is much less volatile than real labour productivity growth (1996 – 2010).

Productivity growth is an important factor for understanding the impact of the wage trends in Malaysia (Abdul-Ghani et al., 2001). As reported in the Eighth Malaysia Plan, an increase in labour productivity based on sales is greater than an increase in wages, i.e. an average 10.4 per cent and 6.8 per cent per annum respectively from 1995 to 2000. Hence, per unit labour cost decreased by 3.2 per cent on average (EPU, 2001). To sum up, Malaysia's economic growth, as represented by real labour productivity, was generally higher than the growth in Malaysian society's standard of living, as measured by the average monthly real wages. This situation provides a rough idea of the positive and weak relationship between pay and productivity. A higher contribution by workers to manufacturing output justifies higher wages. But what exactly is the rationale behind this? And how can we ensure that the proceeds from growth can benefit workers through the wages they receive each month? In order to better understand these issues, it is important to understand first how wages are actually determined.

1.3 Motivation for the study

In any economy, the process of pay determination is a complicated one. The pay is not solely determined by the market forces of supply and demand. Pay determination is also influenced by the relevant government policies and national legislation for industrial relations. Collective bargaining is regulated through legislation on industrial relations. Apart from the law, the government also sets up policies on guaranteed minimum wages and minimum statutory benefits to protect workers. Pay formation, therefore, is the outcome of interactions between government, employers, and workers.

The pay formation system is of utmost importance to economic development. Almost all employees in developed countries have higher wages due to a remuneration system that rewards productivity. In Malaysia, pay remains stagnant and lower than in other regional economies, and may not accurately reflect employee and/or firm performance (EPU, 2010). Currently, issues related to pay and the labour market in Malaysia are being hotly debated. The Malaysian labour market is facing a significant challenge as it seeks to achieve the 2020 goal of being among the elite club of developed and high-income economies. Various issues are closely related to Malaysia's human capital and pay structure.

According to the Malaysian Prime Minister, Datuk Seri Najib Tun Razak, Malaysia's pay structure needs to be reviewed. He also stated that the government will put in place measures to ensure that the pay structure is commensurate with the country's pool of talents. He argued that human talent in Malaysia has somewhat been undervalued. So the government needs to find a mechanism that can raise the country's pay levels (Bernama, 2010). According to the Eighth Malaysia Plan (EPU, 2001), and in view of intense competition due to globalization, the government of Malaysia, in collaboration with the private sector, has placed a lot of emphasis on the importance of the relationship between pay and productivity.

Studies on pay formation and pay structure are crucial to understanding and explaining how pay is determined and structured in any economy including developing ones such as Malaysia's. Pay formation is a key element in economic growth and economic transformation because from the perspectives of efficiency and equity, pay plays an important role in the economy. In order to provide a better understanding of important economic issues such as income distribution, poverty, consumer spending, and the perpetuation of inflation, we first need to understand the pay determination process (Groshen, 1990). A study of pay formation and pay structure can provide a better understanding of how the Malaysian wage model works. The Malaysian government has admitted that in order to improve the standard of living and reduce poverty, employees' pay ought to be increased. The increase in pay should nonetheless be followed by an increase in productivity. Otherwise, it would lead to problems such as aggravated inflationary pressures, weakening the country's international competitiveness, and reducing its attractiveness as a profitable centre for foreign direct investment. In general, the study of pay formation is important for answering questions such as the following: (1) what are the important factors that determine the level of pay for individuals, firms, sectors, industries, and nations? (2) what are the effects of workers' characteristics, firm's characteristics, and government policies on pay?

In neoclassical economics, wage rate is the labour market outcomes driven by the interactions between two parties, i.e. employers and employees. It is crucial and timely to understand these interactions in light of the dramatic changes in the international economy over the past several decades (Haltiwanger *et al*., 2007). For example, if there are changes in technology or job restructuring at the firm level, these changes also affect employees in those firms. Consequently, all policies are driven by a certain understanding of these effects. Theoretically, the determination of wage rates by employers is based on the supply-side (i.e. employees' characteristics) and demand-side (i.e. employers' characteristics) factors in the labour market. Empirically, the strength of each factor can only be assessed if the observed characteristics of employers and employees are simultaneously captured, as well as allowing for the unobserved personal and firm effects within the regression equation that explain the determination of wage rates.

Until recently, most econometric analyses of individual pay in Malaysia were based on datasets that had only worker-level data (i.e. based on individual or household surveys). For example, studies by Lee and Nagaraj (1995), Ismail and Mohd Noor (2005), Milanovic (2006), and Ismail (2011) used worker-level data based on surveys of individual workers in the Malaysian manufacturing and services sectors. Meanwhile, studies by Ismail and Jajri (2012) used worker-level data based on households surveyed in 2007/2008 for all sectors in Malaysia. Therefore, the understanding of the interactions between workers and employers in determining individual pay rates in Malaysia has been limited, as these data sources contain information from only one side of the market, and are therefore incapable of analysing models that incorporate both labour supply and demand factors.

In recent years, data that combine employees' characteristics and specifications of the firms in which they work – i.e. matched employer-employee datasets (hereafter MEED) – have become increasingly available. These datasets therefore combine the observations on typical firm-level variables (e.g. value added, factor employment.) with socio-demographic data (e.g. employees' age, job tenure, ethnic origin, gender, experience, skill, pay.). MEED has led to an explosion of interest in research on the outcomes of labour market interactions between firms and workers. And despite the proliferation of studies on individual wage rates using MEED, studies that use this type of data for developing countries are rather limited.

However, the Second Productivity Investment Climate Survey (hereafter PICS-2), which contains both information on employers and employees, has become available in the case of Malaysia since 2008. This survey contains two different levels of datasets, i.e. the worker-level dataset (hereafter WLD) and the firm-level dataset (hereafter FLD)[1]. Both datasets are then merged to develop the matched worker-firm dataset (hereafter MWFD) for Malaysia. This is the starting point of this thesis, which draws on this newly available representative dataset to examine the determination of pay in the Malaysian economy by taking greater account of the employees' and their employers' characteristics.

[1] These datasets are described in detail in Chapter 4.

1.4 Aims and research questions

The general objective of the thesis is to examine the determinants of pay in the Malaysian economy from three different perspectives (viz. employees' perspective, employers' perspective, and both employees-employers' perspectives). Specifically, this study differs from previous studies on pay in Malaysia in more ways than one. By using a disaggregated dataset from the PICS-2[2], this study adds a new dimension to pay analysis in Malaysia for the reason that PICS-2 will allow for addressing the following questions:

1. What are the key determinants of the individual workers' pay in the Malaysian manufacturing sector?
2. How is individual worker's pay affected by employers' characteristics such as basic human capital, demographic, training, skills, occupation and location?
3. To what extent have these variables managed to explain pay variation in the Malaysian economy?
4. What are the important determinants of average firm-level pay rates in Malaysia?
5. How do employers' characteristics such as employer size, firm performance, governance, ownership, capital, regional and industrial variation influence the average firm-level pay rates?

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[2] PICS-2 obtained from the World Bank's enterprise survey website (http://www.enterprisesurveys.org/).

6. Does the Malaysian pay model at the firm level support the theory of monopsony?
7. How is the individual worker's pay affected by the employer-employee specific-effects in the Malaysian labour market?
8. Between observable worker characteristics and unobservable employer heterogeneity, which one is predominant in determining workers' pay?
9. What are the relations between pay structure and firm's performance and input?

1.5 Contribution of the thesis

The special contribution of this study is to include for the first time the employer's perspective in examining the determination of pay in Malaysia. From a theoretical perspective, firms are central to many theories of the labour market. For example, wages reflect marginal productivity wherein wages differ across firms because firms utilize capital to different degrees or offer workplaces that differ with respect to amenities – the classical view (Cahuc et al., 2002). Wages motivate workers to put in efforts, so employers offer higher wages if they find it hard to monitor their workers - the efficiency wage view (Shapiro and Stiglitz, 1984; Kruger and Summers, 1988). Wage differentials across firms for homogenous workers are due to search frictions – the equilibrium search theory (Burdett and Mortensen, 1998; Mortensen, 2003). Finally, since the elasticity of the labour supply facing the firm is finite, the monopsony theory also emphasizes that the firm is important in any wage determination (Manning, 2003).

The incorporation of the firm-level in empirical research on pay determination in Malaysia is facilitated by the availability of PICS-2, which includes both employer and employee data. The measurement of labour input at the worker-level as well as at the firm-level can be improved by using the employer-employee matched dataset. Additionally, richer information on workers' characteristics in firms can be used to model and measure the labour input directly for the different types of employees employed in a firm. Furthermore, the theories of wage determination can be tested for the case of Malaysia by contrasting estimates of the relationship between the employees' characteristics and their productivity with estimates of the relationship of these characteristics to wages.

In short, the thesis makes three contributions to the existing knowledge and literature: firstly, it examines the effects of workers' characteristics on pay structure in Malaysian manufacturing at the worker-level dataset. Secondly, it examines the determination of the average firm level wage rates in the Malaysian manufacturing sector using the firm-level dataset. Finally, it examines the role of employer-employee specific effects in determining worker's pay by using the matched worker-firm characteristics dataset.

A further contribution of this study is to include the region of Sabah and Sarawak, which has long been neglected in many previous studies due to a lack of data. Therefore, this study can provide a more comprehensive picture for Malaysia compared to the many previous studies that only captured Peninsular Malaysia. Besides, this thesis is among the first of its kind to develop and utilize especially the matched employee-employer dataset towards exploring the pay structure in Malaysia.

1.6 Research design

This thesis adopts a quantitative approach. This approach comprises four main steps. The first step involves reviewing the existing theoretical and empirical literature on pay determination. This necessarily provides the background to my analysis. The second step mainly involves data collection, data sorting and preliminary data analysis that yields descriptive statistics. This research only has access to cross-sectional datasets obtained from PICS-2. The descriptive analysis allows one to gauge the comparability and reliability of the datasets. The third stage involves an econometric analysis, and here the STATA 12 software package is used to estimate all of the econometric models. The final stage involves interpreting the empirical findings to see whether the results are consistent with the theoretical insights and previous empirical findings.

1.7 Structure of the thesis

Apart from this introductory chapter, the remainder of the thesis is organized as follows. Chapter 2 reviews both the theoretical and empirical literature on pay determination. This chapter consists of two sections. The first is a review of the evolution of theories of wages from historical to contemporary periods, and finally to alternative theories of the labour market. The second discusses the empirical evidence of pay determination in developed and developing countries, and then focusses more closely on the case in Malaysia. The literature presented in this chapter sets the theoretical background for analysing pay determination in the Malaysian economy.

Chapter 3 discusses the background to Malaysia's economic performance and labour market. Specifically, this chapter describes the contribution of Malaysia's manufacturing sector, Malaysia's wage system and its trend, as well as some issues relevant to the Malaysian labour market.

Chapter 4 provides an overview of the three datasets used in this thesis. We first describe the source, sampling frame, and design of the PICS data. Then, we present – by means of a table and graph – the structure of the worker- and firm-level dataset, respectively. Next, we outline the construction of the matching procedure and introduce the core variables of the matched worker-firm dataset for Malaysia. Moreover, we further provide some descriptive statistics and analysis of the sample for worker-level, firm-level, and matched worker-firm level datasets.

In Chapter 5, the thesis examines the determination of individual workers' pay from the employee's perspective alone. In this respect, we focus only on the effects of the supply-side factors (i.e. workers' characteristics) on the individual workers' pay. We use the WLD for Malaysia's manufacturing sector. Apart from using new datasets obtained from PICS-2, this chapter also adds new variables to the Malaysian pay equation such as skills, on-the-job training, off-the job training, studying abroad, and distance from work – all of which will be estimated based on the extended Mincerian wage model using OLS with robust standard errors as well as Quantile Regression (QR) analysis. These estimations are conducted separately for all workers, male and female. The QR, which was introduced by Koenker and Bassett (1978), is employed to control for individual unobserved heterogeneity. The QR extends the regression model to conditional quantiles by allowing one to quantify the effects of worker characteristics at specific quantiles, e.g. 10^{th}, 50^{th} and 90^{th} quantiles of the individual's conditional pay distribution.

Chapter 6 analyses empirically the effect of employer characteristics on Malaysia's average firm-level pay rates in the manufacturing sector. Initially, this chapter discusses briefly the theoretical background to the monopsony model of labour market. This chapter utilizes the Malaysian FLD to ascertain the effect of employer characteristics and elasticity of the average firm-level pay rates with respect to employer-size. In this respect, this chapter presents and discusses the results based on an estimation of the Malaysian pay model at two different employer-size measures. The former will use employer-size dummies, while the latter will use a continuous employer-size variable proxy by log of employment. Both estimations also include other important employer characteristics such as productivity, profitability, and ownership. In this chapter, the static monopsony model by Manning (2003) was adopted as a tool for estimating the Malaysian pay model using the OLS estimator with a robust standard error.

Chapter 7 examines the determinants of Malaysia's pay rates using the matched worker-firm dataset. This study allows for a more in-depth analysis of the worker- and firm-specific effects on the individual worker's pay. Moreover, this matched data is capable of capturing the worker-firm specific effect. Due to the unavailability of longitudinal matched data, we are unable to disentangle part of this specific effect that is due to unobservable worker or firm heterogeneity. And so, we adapted the two-stage estimation strategy proposed by Abowd, Kramarz, Morgalis and Troske (2001) in order to control any potential simultaneity bias.

The final chapter summarises and synthesises the main findings of the thesis and highlights those factors that determined Malaysia's manufacturing pay rates from three different perspectives. Consequently, this chapter discusses some policy recommendations, and then acknowledges some inevitable limitations of the thesis, before finally offering some suggestions for further research.

CHAPTER 2 : LITERATURE REVIEW ON PAY DETERMINANTS

2.1 Introduction

This chapter reviews both the theoretical and empirical literature on pay determination and its structure. This review defines the key terms and definitions commonly used in the literature on pay determination and its structure, summarises the theories and models of pay determination, and then identifies the determinants of pay and its structure in developed and developing countries' labour markets. A review of the theoretical and empirical perspectives on pay determination is very important and useful for our analyses in the subsequent chapters. The former can build a firm theoretical foundation for the empirical analyses, while the latter can help us identify the determinants of pay and its structure, as well as providing us with a better understanding of the methodology used and limitations of the datasets, estimation methods, and results.

The organisation of this chapter is as follows. The second section (2.2) briefly defines and measures pay, before evaluating the different concepts and measures found in this area. The third section (2.3) explores the evolution of pay determination theories, and here historical theories of wages, contemporary and alternative theories of the labour market are discussed. Section four (2.4) gives a brief summary of the empirical explanations on pay determination in developed and developing countries. Following this, section 2.5 focuses on the empirical evidence on pay determinants in Malaysia. The final section (2.6) summarises and concludes this chapter.

2.2 Defining and measuring pay

Before reviewing pay determination theories and evidences, it is important to determine the true meaning of workers’ pay and how it is measured. This term is critically important to every employer and employee, and bears huge implications especially if wrongly interpreted. Workers’ pay or wages are defined as a fixed regular payment earned for work or services rendered, typically paid on a daily, weekly, or monthly basis. Based on Malaysia’s Employment Act 1955 under section 2, wages means basic wages and all other payments in cash payable to an employee for work done in respect of his/her contract of service but does not include:

a) the value of any house accommodation or the supply of any food, fuel, light or water or medical assistance, or of any approved amenity or approved service;

b) any contribution paid by the employer on his own account to any pension fund, provident fund, superannuation scheme, retrenchment, termination, lay-off or retirement scheme, thrift scheme or any other fund or scheme established for the benefit or welfare of the employee;

c) any travelling allowance or the value of any travelling concession;

d) any sum payable to the employee to defray special expenses entailed on him by the nature of his employment;

e) any gratuity payable on discharge or retirement; or

f) any annual bonus or any part of any annual bonuses.

In other words, wages consist of the basic salary of an employee and any allowances in respect of work done. According to section 2 of Malaysia's Employees Provident Fund Act 1991, wages means all remuneration in money, due to an employee under his contract of service or apprenticeship whether agreed to be paid monthly, weekly, daily or otherwise, and includes any bonus, commission or allowance payable by the employer to the employee whether such bonus, commission or allowance is payable under his contract of service, apprenticeship or otherwise, but does not include:

a) service charge;

b) overtime payment;

c) gratuity;

d) retirement benefits;

e) retrenchment, lay-off or termination benefits;

f) any travelling allowance or the value of any travelling concession; or

g) any other remuneration or payment as may be exempted by the Minister.

In this thesis, the term 'pay' is used interchangeably with wages, salary, remuneration, compensation, and earnings. Mincer (1974) claimed that weekly earnings were preferred as a dependent variable in the model. One of the advantages of using hourly pay compared to the weekly or monthly one is that it is more precise. For example, some surveys show that men work more hours a week than women, which leads to severe inaccuracies in the estimated models of weekly pay (Drolet, 2000). However, in the literature on human capital earnings function, other measurements of earnings such as (the log of) gross monthly or gross annual earnings have been used as a dependent variable, even though there are also some studies based on net earnings. In the case of Malaysia, pay is calculated on a monthly basis, and as such, the dependent variables used will be (the log of) gross monthly pay instead of hourly pay. Employers are required by law to pay workers' salaries by the seventh day after the last day of the wage period. Since workers in some firms work five days, or five and a half days in other firms, it is cumbersome and unnecessary to calculate wages on an hourly basis, as seen in much of the literature.

2.3 Theoretical review of pay determination and structure

Economists have long developed wage theories to understand wage determinant and its structure. Wage theories can help any researcher to understand more precisely the functions involved in determining wages. The difference in the types and levels of wage issues requiring different kinds of wage theories has produced a revolutionary theory of wages. For example, the problem with the general wage level may require an explanation about average wages. This is different from those required by the problem of particular wages which may require a discussion and description of the reasons why A's wages are more or less than B's (Davidson, 1898). This section is divided into two parts, i.e. firstly historical theories and secondly contemporary labour market theories.

2.3.1 Historical theories on pay

Theories of wages have also evolved in tandem with the worker's stages of development. The order and character of these theories had changed ever since the disappearance of servitude and serfdom to the rise of real freedom (Davidson, 1898). The Industrial Revolution that began in Britain had resulted in a gradual change in the lot of workers and working conditions in factories across Europe. The influx of people due to migration and high birth rates created job-shortages while increased unemployment resulted in further domination by employers who were more than willing to set lower wage rates (Davidson, 1898). But this situation changed significantly when trade unions were formed, giving power to the working classes to seek more just wages. When this happened, employers openly joined forces to make their power more effective and keep wages down. An appraisal of the current state of wage theory needs to consider it from a historical perspective.

Classical economists began their analyses of wages from the platform set out by Adam Smith in his book entitled *The Wealth of Nations*, especially the chapter "of the wages of labour". This platform provides a plausible explanation of the relationship between the price of goods and amount of labour required to secure them, what is now known as the classical wage theory. This 'subsistence theory' is the earliest and oldest theory of wages, first introduced by Adam Smith (1723-1790). This theory has undergone several stages of revision. Wages are determined according to this theory based on the cost of the commodities needed to enable workers to live, and the cost is determined by the absolute power of the capitalists and employers. This theory is also recognized as "the iron law of wages", of which David Ricardo was one of the main proponents (1772-1823). Elements of this subsistence theory first appeared in Smith's *The Wealth of Nations* (1973):

> *A man must always live by his work, and his wages must at least be sufficient to maintain him. They must even upon most occasions be somewhat more; otherwise it would be impossible for him to bring up a family and the race of such workmen could not last beyond the first generation (57-58).*

In other words, the wages paid to employees had to be enough to provide them with food, clothing and shelter, making sure they continue to exist and support their families. Wages are determined by the cost of labourers' basic needs; and they are clearly based on a real or assumed similarity between wage labour and slave labour. Ricardo (cf. Davidson, 1898) suggested that to meet the additional labours required, the population must be increased sufficiently by enhancing wages to a level higher than the minimum subsistence level, at least in a growing economy. He also stated that the average wage level is consistent with the theory of population by Malthus. Thus, in the short term, wages above the subsistence level will raise the size of the working population and thus increase the supply of labour. Excess supply of labour, however, will cause wages to fall back to the subsistence level.

Conversely, wages below the subsistence level will reduce the size of the working population and hence the supply of labour. Therefore, an excess demand for labour will cause wages to rise above the subsistence level once again. In the long term, the average wage level would conform to the subsistence level. Moreover, Ricardo argued that the subsistence theory essentially relies on the habits and customs of people. Based on cases in Britain, Stigler (1976) highlighted four drawbacks to the subsistence theory of wages. In his first argument, the cost of subsistence during winter exceeds that of summer, while the level of wages varies inversely. Secondly, the cost of subsistence varies considerably over the years, while wages change slowly. Thirdly, the cost of subsistence varies considerably from place to place, even though wages vary a lot less in one place. Fourthly, differentiations as to the cost of subsistence over time and place are often inversely related to the level of wages. This theory has been criticized due to its neglect of the demand aspects of the labour market because it assumes that changes in the supply of labour are the basic force that drives real wages to the subsistence level. Besides, there are several other weaknesses to this theory. Firstly, it assumes that the subsistence level is uniform for all employees. Secondly, it does not explain the differences between wages in different occupations. Thirdly, it does not explain wages in short-term fluctuations.

The short-term version of the classical wage theory was known as the wages-fund theory, which was complementary to rather than a substitute for, the subsistence theory. The wages-fund theory was developed in the early nineteenth century. This theory was first presented by John Stuart Mill. According to this theory, the average wage rate is determined by the demand and supply of labour (Davidson, 1898; Miller, 1940). The essence of this theory was stated in *The Wealth of Nations* (Smith, 1973):

> *The demand for those who live by wages, it is evident, cannot increase but in proportion to the increase of the funds which are*

> *destined for the payment of wages. These funds are two kinds; first, revenue which is over and above what is necessary for the maintenance; and, secondly, the stock which is over and above what is necessary for the employment of their masters* (58).

This theory was based on changes in the employers' level of power, from domination to mere predomination. This means that employees have little power to increase their wages even by exercising self-restraint and restricting their numbers in the labour market. This, according to John Stuart Mill, is because the theory explained short-term variations in the general wage level in terms of: (1) the number of available workers; and (2) the size of the wage fund. This theory assumed that wages of workers are paid from the capital fund (the size was fixed), which presumably had been accumulated by the employer within a given period of time such as a year (Miller, 1940). The level of average wages is the ratio between the total wage fund and the number of labourers employed (Stigler, 1976). Increasing the wage fund by employers, followed by an increase in the number of employees as expected, did not increase the wage rate.

According to Davidson (1898), there is a small number of workers who are willing to work regardless of the level of wages at any particular time. Besides, in any country at a given time, there are funds allocated for the payment of wages, referred to as the wage fund. In addition, the distribution of funds to the workers is determined by competition, while the wage rate is dependent upon the correlation between the amount of funding and the population. He also pointed to many economists who believe that wage is affected more by the demand for goods rather than the size of the wage fund. The weakness of this theory is to assume that the wage fund is fixed and that it accounts for labour demand. Most employees are paid out of the current production, and both employers and employees, however, often talk as if such funds exist, as if they determine the amount of labour services needed. They may also accept the implication of the theory, advocating for shifting a share of wages from one group of wage earners to another. The wage-fund theory discusses the issue of general wages but it fails to discuss wage as a particular issue. This is a theory regarding the source from which wages are paid rather than explaining the actual differences in wages received (Davidson, 1898).

In countering the wage-fund theory, an alternate theory known as the residual claimant theory was proposed by Francis A. Walker, who argued that labour receives what remains after the payment of rent, profits, taxes and interest out of the national income (Davidson, 1898). The employee's demand for wages represents the residual claimant on output after rent, interest, and profit have been deducted. Walker also suggests that if productivity of labour increases without increase in capital or land, its residual would increase, and this is the germ of any productivity theory. This theory ignores the supply side in the determination of wages. It fails to explain how trade unions raise their wages. Residual claimant is the right of the employer and not the employee. The labour receives its share during the production, so that if firms suffer a loss, labour will bear the loss.

2.3.2 Contemporary labour market theories

A conventional starting point in economics is the neo-classical model of the labour market under which wages are determined by the forces of supply and demand. The neo-classical theory assumes that the firm is a wage-taker in labour markets, and that the worker is paid according to its marginal product, i.e. the value of an additional amount of output produced by an additional worker. In this theory, a worker is assumed to be a homogenous input. The competitive labour market theory assumes that labour supply is perfectly elastic, namely, at the going wage rate where the firm can hire as much labour as it wishes. If there is any improvement in the firm's profit, this will be translated into increased output and employment at the going wage prior to improvement in the firm's profit. In this case, higher wages are paid to workers in short supply.

In a competitive labour market, the wage rate paid for labour will be equated with its marginal productivity. Therefore, an individual with better marketable skills has higher productivity and thus more opportunities in the labour market to earn higher wages through a good job. Training and health are other important and integral parts of human capital. According to Schultz (1961) and Strauss & Thomas (1995), training and health also increase the productivity of workers, hence, their wages, too.

This marginal productivity theory is an employment theory that contrasts those discussed earlier in that it gives power to employees through trade unions in determining their wages rather than becoming the residual owner of the product.

Employees' wages depend for their efficiency on production. John R. Hicks (cf. Shove, 1933) assumed that labour is homogenous, and that product and markets are perfectly competitive, even as both land and capital are fixed. He argued that in equilibrium, labour should receive the same wage, and, that the wage rate must be equal to the value of the marginal productivity of labour. Hicks also stated that employers would continue to hire workers to the extent that marginal product equals marginal cost. This theory also explained the differentials in wages due to differences in marginal product.

The marginal productivity theory also has limitations. This theory only explains the nature and behaviour of labour demand, and wage determination only to some extent. Since few markets are perfectly competitive, while firms and workers are rarely free to enter and leave the labour market without delay, the lack of knowledge on the market and the presence of trade unions render the neo-classical model unrealistic as well as undermining its popularity. Besides, the neo-classical approach to wage determination is also rejected as it overplays the role of the invisible hand of the market (e.g. Rubery, 1997; Manning, 2003).

Recently, the existence of inter-firm wage differentials for similar workers has been well established in the literature. In other words, similar workers earn very dissimilar pay when working for different firms. This is contrary to the most basic neoclassical model of the labour market which suggests that pay should be equal for similar workers. So, what exactly accounts for such pay differences? There are some neoclassical theories that explain the existence of pay differentials in terms of relaxing the assumptions of perfect competition, profit maximization, and homogeneity of workers, e.g. human capital theory, theory of equalizing differences, and efficiency wage theory.

The human capital theory explains wage differentials as a consequence of disparity in the qualities of employees, i.e. in terms of the knowledge, skills, aptitudes, education and training of an individual or a group of employees. Human capital is defined as the skills, education, health, and training of an individual (Becker, 1962). These endowments are considered capital because of their similarity to physical capital, which yields returns. Kooreman and Wunderlink (1997) stated it this way: “All such qualities of a person, such as knowledge, health, skills and experience that affect his or her possibilities of earning current and future monetary income, psychological income, and income in kind are called human capital”. The human capital theory addresses the heterogeneous nature of the labour market, relaxing the basic neoclassical model’s assumption of homogeneity, and it remains the dominant theory of wage determination. According to this theory, wages are determined based on the marginal product of labour, and human capital is a component for judging the productivity of the worker. For example, higher skilled employees should earn higher wages.

Workers invest in education, training, health care, or migration, in expectation of increasing their productivity. Firms, motivated by a desire to maximize profits, reward productivity according to the human capital of each labourer. This theory is principally based on education because it provides knowledge and skills (Tilak, 1994). The direct effect of education is measured in terms of pecuniary benefits accrued to the individual

(Becker, 1962; Mincer, 1974; Hungerford and Solon, 1987; Tilak, 1994; Zuluaga, 2007). Investment in education enhances the ability of individuals and makes them more productive and efficient (Lockheed et al., 1980; Jamison and Lau, 1982). This theory analyses the impacts of additional education, experience, and on-the-job training on the quality of the labour force. In addition, this theory also analyses workers' and firms' decisions on investment in human capital. The human capital theory may yield even more information on the qualitative dimension of labour supply when applied to on-the-job training. Training within firms involves costs. To minimize those costs, firms usually try to hire and keep experienced workers. On-the-job training can be usefully divided into general and specific training[3].

Based on the theory of equalizing differences, often referred to as compensating differentials, pay differences across workers are entirely accounted for by the intrinsic properties of specific occupations, quality of the working conditions under which they work, and the non-wage components of the compensation package. The arguments of this theory are based on five properties[4]. Firstly, ease of learning the occupation – tough jobs or jobs that take a long time to learn as well as time spent for training will be compensated for with higher wages. Secondly, the agreeableness of the job – unpleasant working conditions will have higher wages. Otherwise, preferable working conditions will lead workers to accept a lower pay due to the fact that they are being compensated in a non-pecuniary form. Thirdly, there is also the degree of

[3] General training provides skills useful to the firm giving the training as well as to other firms. Specific training provides skills useful to the former alone.
[4] It can be traced directly to Adam Smith's *The Wealth of Nations*.

responsibility – workers who have higher responsibility will be compensated with a higher pay. Fourthly, consistency of job – inconsistent job throughout the year, such as workers in agriculture, must be paid more for their labour because their wages must be taken into account not only during times of employment but also during times of unemployment[5]. Finally, the probability of success, namely, if the job is unlikely to succeed, then the pay is higher than for a job that has a good chance of succeeding.

Another neoclassical explanation of pay differentials is the efficiency wage theory. This theory was initially developed in the 1950s to explain why employers paid above equilibrium wages to employees. There are several reasons. Firstly, higher wages are paid to provide an incentive for employees to exert greater effort and not to shrink[6]. Secondly, offering higher wages than the equilibrium wage rate can attract better quality and more productive workers. Thirdly, higher wages also discourage employees from forming a union. Fourthly, higher wages will discourage employees from quitting, resulting in firms' turnover cost being reduced. Fifthly, higher wages enhance the goodwill amongst employees, resulting in increased productivity and profits[7].

The efficiency wage theory assumed that workers are heterogeneous, i.e. their productivity and ability differ considerably. Furthermore, the wages they receive affect

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[5] However, contrary to this argument, in most developing countries, agricultural workers are among the lowest paid.
[6] For example, Shapiro and Stiglitz (1984) explain that employers threaten to fire any employee found performing below some threshold but only monitor individual worker effort at random due to the cost. To make the threat effective, a wage above the worker's immediate outside option must be paid.
[7] See Akerlof (1982).

the effort they put into their work and thus their productivity. The level of effort exerted by each worker is difficult to observe and monitor, so if a firm were to cut wages, the more productive workers would more likely leave, which means that the firm's productivity would fall, and hence its costs would increase. According to this theory, employers have imperfect information on the individual productivity of their employees, and therefore use wages to enhance information dissemination (Leibenstein, 1957). Empirical evidence that supports the payment of efficiency wages includes Krueger and Summers (1988) as well as Blinder and Choi (1990).

2.3.3 Alternative theories of pay determination

It has been increasingly accepted that wage determination is best analysed from the perspective that there is some degree of imperfect competition (instead of perfect competition) in the labour market. Recently, continued research on pay determination has led to a new set of theories which assume that the labour market is imperfectly competitive. The non-market clearing views of pay formation include bargaining theories, efficiency wage theories, agency theory, search-based-wage theories, and monopsony theory.

In the bargaining theory, neither the employer (as in the earlier theories) nor the employee (as in the latest) can be the sole determiner of wages. In this theory, wages, hours, and working conditions are determined by the power of negotiations between employers and workers. Wage rates are determined by the estimate of the employees and that of the employers. The estimate done by employees results from the utility of reward and the disutility of labour. While on the other hand, the estimate done by employers is based on the indirect utilities provided by employees. Nevertheless, Davidson (1898) also argued that factors such as labour productivity, competitive situation, investment size, minimum wage legislation, cost of living of the workers, and rates paid to others should be taken into consideration by both employers and employees in any determination of wages. According to Bhaskar et al. (2002), one of the assumptions in a labour market with perfect competition is perfect mobility. Employers have to compete with one another to get workers and this would lead to a single market wage, such that employers will lose their existing workers instantaneously if they try to cut wages. In other words, perfect competition indicates that the wage elasticity of the labour supply curve facing an individual employer is infinite.

Bryson and Forth (2006) claimed that under perfect competition, workers and employers are in turn ‘wage takers’ as they receive a single wage at labour market equilibrium. However, disequilibrium may arise over time but it is expected that market forces would adjust to it. They also said that the neo-classical theory predicts a positive relationship between wages for workers and their productivity. Machin and Manning (2002) studied the wage structure for care assistants in residential homes for the elderly on England’s “sunshine coast”, which they approximated to be a perfect competitive model. This was because they first assumed that there were a large number of small firms undertaking a very homogenous activity in such a concentrated geographical area. Secondly, the workers they employed were not unionized nor were they covered by any minimum wage legislation, such that there were effectively no external constraints on the wage-setting process. They found that the competitive model is limited and does not help in explaining the structure of wages in this market. This is shown by the existence of a small wage gap within a single firm and a large gap between firms. This situation only goes to show that the ‘law of one wage’, in which there is a given market wage for each quality of labour, does not seem to hold.

The modern economist opines that remuneration of labour, i.e. wage, is determined by interaction of the forces of demand for and supply of labour. Demand for labour is derived from the demand of products and services produced by the labour. If the demand for a product is high in the market, the demand for labour producing that particular type of product will also be high. Conversely, if the demand for the product is low, the demand for that particular labour will also be low. In addition, the demand for labour will be elastic if the demand for the product it produces is elastic due to cheaper substitute(s) of that product being made available in the market. Likewise, the demand for labour will be inelastic if the demand for the particular product it produces is also inelastic. The wage rate is determined at the point where labour demand and supply are equal to each other.

Imperfect competitive labour market theories give rise to different predictions. For a monopolistic firm, it is expected that the firm would pay a reservation wage, and if wages are paid equally to each worker, then the wage will be smaller than the marginal product of labour. Monopsony is a market with a single employer. So that existing workers would not be able to move to another firm if and when the employer decides to reduce the wage as there is only one firm in the market. However, some may return to non-labour market activities. In a dynamic monopsony model, larger firms pay higher wages. At the same time, these firms are subject to lower quit rates and find hiring easier and cheaper, thus enabling them to increase in size (Burdett and Mortensen, 1998). Unlike monopsony, oligopsony has more than one firm in a market. However, even in this market, the employer's market power still persists. Monopolistic competition amounts to oligopsony when there is free entry, thus ensuring that the employer's profits are driven to zero.

Manning (2003a), in his book entitled *Monopsony in Motion*, initiates a discussion on the imperfect competition in labour markets by raising the question: "What happens if an employer cuts the wage it pays its workers by one cent?" In a perfect competition labour market, assuming that the labour supply curve facing the firm is infinitely elastic would result in all its existing workers immediately leaving the firm. In contrast, Manning argued that the labour market under imperfect competition differs from that under perfect competition because of two assumptions. Firstly, there are important frictions in the labour market, such that employers have some market power over their workers. Secondly, employers set wages as a way of exercising this market power. From these assumptions, it can be said that in an imperfect competition labour market, the employer who cuts wages does not immediately lose all his/her workers. Frictions in the labour market arising from plausible sources such as ignorance, heterogeneous preferences, and mobility costs may force employers who cut wages to recognise that their workers quit-rate is faster than earlier rates or that recruitment is more difficult instead of immediately losing all their workers. In an imperfect competition, the supply labour curve facing the firm is not infinitely elastic.

These two assumptions in a monopsony model could describe the decision-problem facing the individual employer. In Manning's perspective, monopsony refers to the individual labour supply not being infinitely elastic, i.e. not monopsony, in the sense of there being a single buyer of labour. Hence, models of oligopsonistic or monopsonistic competition are used to model the market as a whole. Bhaskar *et al*. (2002) argued that both oligopsonistic and monopsonistic competition models are able to explain a lot of empirical phenomena in the labour markets. Through a simple model with job differentiation and preference for heterogeneity, they were able to explain the existence of wage dispersion, the persistence of labour market discrimination, market failure in the provision of training, and the unusual employment effects of minimum wages. They also added that preference for heterogeneity in jobs, mobility costs, and imperfect information is the main source of oligopsonistic power.

According to Bhaskar *et al*. (2002) and Manning (2003a), recently the labour market seems to have monopsonistic characteristics because employers seem to have some market power over their workers. This statement was later supported by Manning (2004) who argued that labour market intervention, namely minimum wages, trade unions, and unemployment benefits, will not necessarily give the trade-off effect between efficiency and equality in monopsonistic labour markets. Proponents of monopsony argue that such an assumption in a perfect competition is rather extreme (i.e. reduction of wages by one cent would cause all workers to move to other firms instantaneously) and contrary to common sense and empirical evidence (Manning, 2003a).

Manning (2003b) argued that employers would possess a significant monopsonistic power when labour markets become ‘thin’ such that workers have limited job opportunities at any given moment. This statement is based on findings in his research, namely that workers’ commuting patterns reveal ‘thin’ labour markets. Besides, most people tend to look for a job with a maximum wage and a minimum commute even if it is somewhat difficult. Nevertheless, the proportion of ‘wasteful’ commuting is in reality relatively large. Manning (2006) presents a generalised model of monopsony to show that the division between perfect competition and monopsony is diseconomies of scale vis-à-vis recruitment. However, through analysis using a British dataset containing information on both labour turnover costs and number of recruits, he found that there is an increasing marginal cost of recruitment. This result is supportive of the view that the labour market is monopolistic because the supply of recruits to the firm is not perfectly elastic at any given level of recruitment cost.

Wages are higher in larger firms. The positive relationship between firm size and wages is well documented in the literature. A labour market in which wages depend on employer size means that jobs are different (Oi and Idson, 1999). A job consisting of a vector of variables would normally include the rate of pay, the nature of the tasks, opportunities for promotion, the length of the workweek, the stability of employment, health and injury risks, and characteristics of the workplace. Jobs can be categorised by occupation, industry, ownership (public versus private), geographic location, or employer size.

The human capital theory states that firm size will be correlated with some dimension of labour quality. According to the labour quality hypothesis, large firms hire more qualified workers than small firms (e.g. Hamermesh, 1990; Kremer and Maskin, 1996; Troske, 1999), and this explains the higher labour productivity and higher wages. Large firms hire more skilled workers due to their greater capital intensity and capital-skill complementarity in the production process (Hamermesh, 1980). In addition, Oi (1983) argued that large firms, being more innovative, need more qualified and specialised workers. Large firms also have the advantage of matching high-skilled workers with a fixed cost when hiring them (Kremer, 1993). Moreover, large firms ultimately find it less costly to adopt technologies because they can spread the fixed cost of their investment across more workers and output (e.g. Dunne and Schmitz, 1992).

According to the compensation wage differential theory, large firms tend to be more rigid in organisational structure and rely more on rules to discipline workers (Mellow, 1982). Large firms also impose greater pressure on workers and could thus suppress workers' creativity (Lester, 1967). As a result, workers in large firms may earn a compensating wage differential for less satisfactory work (Masters, 1969; Waddoups, 2007).

The rent-sharing and market power theory claims that large firms have more financial resources (e.g. larger profits, better access to credit market) and use their ability to pay to increase workers' morale and effort (Slichter, 1950; Akerlof, 1982). Large firms also have more market power and share their excess profits with their workers (e.g.

Mellow, 1982; Slichter, 1950; Weiss, 1966). They also offer wages above the average market level in an attempt to reduce shirking and turnover costs following the efficiency wage theory (Shapiro and Stiglitz, 1984) or simply to avoid or mimic unionisation (e.g. Brown *et al*., 1990; Voos, 1983).

2.4 Empirical studies on pay

Wage rates are the results of interactions between workers and employers within a workplace. Understanding these interactions is critical for policy purposes, as one might consider operating on the supply- or demand-side of the labour market to enhance workers' pay. Therefore, to understand the interactions between employees and their employer, we need data from employees as well as from their employers which contain information on both the supply- and demand-side of the labour market. Recently, the availability of appropriate matched employer-employee datasets (MEED) for European countries has enabled dozens of researchers to examine the impact of employees' as well as their employers' characteristics on workers' pay. Previous studies that utilized MEED have already produced many important new results, especially in the area of labour economics.

Generally, wage determinants can be divided into three groups, i.e. firstly, individual worker characteristics; secondly, job characteristics; and thirdly, employer or firm characteristics. Individual worker characteristics refer to human capital variables such as education, experience and tenure. Job characteristics usually include the type of job, the hierarchical position of the worker, functional area, and region. Employer characteristics are often proxy by firm dummies or main indicators such as employer size or number of employees, sales, profit, and net income.

Bayard and Troske (1999) examine the employer-size wage premium using a cross-sectional MEED for manufacturing, retail, and services industries in the United States. They found that even after controlling for demographic characteristics, there is a large and significant establishment-size wage premium in all industries that is similar to previous estimates of the establishment-size wage premium (Brown and Medoff, 1989). However, that understanding is limited, because most studies to date have used either data collected from business establishments or data collected from workers. Because these data sources contain information from only one side of the market, they are incapable of analysing models that incorporate both the supply of and demand for labour. A full understanding of the impacts of recent changes in the labour market and a well-informed policy debate into topics such as earnings inequality, employment security, firm effects on workers, and the effects of technology on earnings and employment depends on the availability of appropriate MEED.

2.4.1 Studies on supply-side determinants

The analysis of supply-side pay determinants is based on Becker's human capital theory (Becker, 1962) and Mincer's wage equation (Mincer, 1974). According to Becker's theory, education is an investment in current resources for future returns. Besides, it is one of the most important components of individual human capital, and thus a significant supply-side determinant of pay. In Mincer's wage model, education is usually measured by years of schooling or levels of educational attainment which is assumed to have a linear effect on pay for each year of schooling regardless of the attainment level. The estimated rates of return to an additional year of schooling were considerably varied across studies. For example, in European countries, this rate was at a level between 3.9–5.7 (Jones & Simon, 2005; Flanagan, 1998) and 11.2% (Compos & Jolliffe, 2002). In Malaysia, however, the rate of returns on education is much higher at between 8.6 and 9.6% (Ismail, 2011) and between 12.3% and 13.7 (Ismail & Jajri, 2012). In terms of returns on educational attainment, the returns on university degree are often estimated at a level of around 50% (Flanagan, 1998) but it is also possible to identify estimates exceeding 80% (Campos, Jolliffe, 2002) compared to primary education in the case of European countries. Besides the quantitative aspect, the qualitative aspect of education also has a significant impact on pay determination. For example, the characteristics of educational institutions can represent the quality of education obtained. It seems that the pay rates are higher for those who graduated from highly selective and elite institutions, even if their occupation is controlled (Monks, 2000; James et al., 1989).

Furthermore, the general labour market experience and tenure (i.e. firm-specific work experience) respectively accumulated through work experience and on-the-job training (Becker, 1962) also have significant effects on pay. In the case of unavailability of relevant data for labour market experience, the age or potential work experience, i.e. age reduced by years of schooling and age at the beginning of schooling (see Mincer, 1974), is often used as approximation of labour market experience. Estimated returns on potential work experience are from 4.0% to 6.0%

(Ismail, 2011; Ismail & Jajri, 2012) in the case of Malaysia. In addition, returns on general labour market experience (which represent statistically significant wage premium for seniority) are substantially larger compared to returns on tenure. In the case of male workers, differences in returns on potential work experience are between 1.4% and 2.5%, while for women the differences are between 1.1% and 2.2% (Flanagan, 1998). In this respect, we can say that the differences in returns on potential work experience are higher in the case of male workers compared to female ones. According to Krueger (1991), workers who have computer skills or able to use a computer at work were rewarded about 13.9% wage premium in 1989. In addition, Krueger also emphasised that there is a significant and different wage premium for different computer tasks.

Gender is one of the important control variables in estimating pay determination using a pooled sample of males or females. However, one should not interpret the statistical significance and magnitude of the gender coefficient directly as gender discrimination on the labour market. This is because, the estimation might be biased owing to the omitted variables which are systematically correlated with gender. For instance, Toutkoushian et al. (2007) and Joy (2003) found a relatively low wage penalty for women at a level from -3.9% to -6.0%. There is also the case which indicates a wage penalty for women exceeding -20% (for example, Carlson & Persky, 1999; Angle & Wissmann, 1981).

Many previous studies on wage determination have included race or ethnicity in their model in order to capture the labour market status of different minorities. Nonetheless, there exists a conflict regarding the interpretation of statistical significance and the size of race coefficients as race discrimination. This conflict can be seen from the mixed results found in various studies that use race as one of the control variables (Toutkoushian et al., 2007; Joy, 2003; Carlson & Persky, 1999; Angle & Wissmann, 1981). In addition, there are also cases where race coefficients were biased due to omitted skills (Finnie & Meng, 2002; Neal & Johnson, 1996). In this respect, the biases occur due to the fact that skills are not equally distributed among different ethnic groups. In estimating the effects on wage of being a member of one of six ethnic groups in Canada, Hum and Simpson (1999) found a wage penalty at a level of -24.1% in the case of black men. Meanwhile, Pendakur and Pendakur (1998) found that wage penalties were only for black men (at a level of -17.4%) and Chinese men (at a level of -12.5%). They also suggested that male workers face higher wage penalties in relation to their ethnicity compared to female ones.

The marital status is normally included in wage equation in order to capture either observable characteristics closely related to a solemnization of marriage (such as stability, loyalty, and responsibility), individual's work effort by spouse's income (such as increased productivity of men financially securing his family), or productivity effort of housework specialization within the family (Stratton, 2000). There are empirical evidence suggesting that wage premiums for marriage men range approximately between 7% and 20% (Hersch & Stratton, 2000). For women, however, it was statistically insignificant (Black et al., 2003).

2.5 Studies on pay in the Malaysian economy

Several factors have been identified as contributors to the pay structure in Malaysia. Factors such as tight labour market, proximity to Singapore, and increased mobility of Malaysian workers have been singled out as contributing to pay increase being offered to employees in Malaysia (Abdul-Ghani *et al*., 2001). They stated that a tight labour market, where employers compete for workers to fill jobs created by the influx of foreign investment induced by the sixth and seventh Malaysia Plan, is a major cause of pay increase among many occupations. Besides, in the Johor Baharu area which is in close proximity to Singapore, the increased mobility of workers creates competition for Malaysian workers among Malaysian and Singaporean firms. Empirical studies on wages in Malaysia can generally be divided into two categories: firstly, studies on the wage formation; and secondly, studies on wage structure.

2.5.1 Studies on pay formation

Studies on wage formation have been conducted by Ho and Yap (2001), Yusof (2008), Goh and Wong (2010), and Tang (2010). These papers specifically examined the relationship between real wages, labour productivity, and unemployment in the short and long term at the national and industry level. Table 2.1 describes the data, variables, methodology, and findings by those studies. In addition, all without exception used a co-integration analysis and error-correction model approach. We may summarise the key finding from these studies in this way: in the long term, productivity has a positive and significant effect on real wages (Ho and Yap, 2001; Yusof, 2008; Goh and Wong, 2010; Tang, 2010).

Based on Table 2.1, there are certain differences to be noted among these studies, even though all studies applied the same broad method. Firstly, the findings are different and inconsistent. Ho and Yap (2001) as well as Goh and Wong (2010) examined the relationship between real wages, productivity and unemployment. They found that in the long run, a rise in wages would exceed a rise in productivity. This leads to an increase in unit labour cost. A one percent increase in productivity leads to an increase in real wages by 1.22 percent (Goh and Wong, 2010). Nonetheless, when controlling for union density variable, real wages increase by 1.96 percent for every one percent increase in productivity (Ho and Yap, 2001). However, when using employment rather than unemployment data, it turns out that the rise in wages is less than the rise in productivity (Yusof, 2008).

In addition, in the long run, Yusof (2008) found that there exists a positive relationship between employment and real wages. Meanwhile, Goh and Wong (2010) found that the unemployment rate has no relationship with real wages and productivity. Hence, this supports the insider-outsider theory of the labour market, that is, unemployment appears to have little effect on wage rates. These different findings may be due to the use of different types of data. Yusof (2008) used quarterly data from 1992:1 to 2005:3 in selected manufacturing industries, whereas Goh and Wong (2010) utilised time series from 1970 to 2005 in ten economic sectors in Malaysia. However, both studies supported the marginal wage theory or performance-based pay scheme theory rather than the efficiency wage theory, that is, higher productivity leads to higher wages and not vice versa.

In contrast to the above studies, Tang (2010) examined the effect of real wages on productivity. He showed that there exists a bi-directional causality between productivity and real wages both in the short and long term rather than uni-directional as found by others. Hence, productivity and wages are complement whereby both marginal productivity and efficiency wage theories appear valid for Malaysia. In addition, it also indicated a quadratic relationship between productivity and wages in the long run, and thus the impact of real wages on productivity is not monotonic.

Table 2-1: Studies on the relationship between real wages, labour productivity, and unemployment in Malaysia

Studies	Data	Variables	Methodology	Results & Conclusions
Ho and Yap (2001) ***Malaysian Journal of Economic Studies, vol. 38***	Annual time-series data (1975 - 1997). *Data Source*: Annual Survey of Manufacturing Industries, Annual Trade Union Reports, and Economic Reports.	*Endogenous*: Real wages *Exogenous:* Productivity, unemployment, and union density.	The Augmented Dickey-Fuller (ADF) unit root test. The Engle-Granger two-step cointegration test. Error-correction model (ECM) by Ordinary Least Square (OLS) regression.	In the long-run, productivity and union density have a positive and significant effect on wages. Real wages increase 1.96 per cent for every one per cent rise in productivity. A one per cent increase in union density will induce a 1.2 per cent increase in real wages. Meanwhile, unemployment rate has a negative and significant effect on wages. Real wages decrease by 0.73 per cent for every one per cent increase in unemployment rate. In the short-run, wages are not significantly influenced by productivity and union density. However, unemployment rate depresses wages by 0.47 per cent for every one per cent rise in unemployment rate. Over the long-run, wages rising faster than productivity will lead to an increase in unit labour cost, thus eroding competitiveness of the Malaysian manufacturing sector.
Yusof (2008) ***Journal of Economic Studies, vol.35***	Quarterly data from 1992:1 to 2005:3. *Data Source*: The Monthly Statistical Bulletin of Malaysia, Department of Statistics Malaysia (DOSM).	*Endogenous*: log of real consumption wages, log of real product wages, log of real wages using GDP deflator. *Exogenous:* log of productivity, log of employment, and log of per capita income.	The ADF, PP, and KPSS unit root test. The Johansen multivariate cointegration test. Vector error correction model (VECM) by OLS regression. The impulse response function and variance decomposition analysis.	In the long-run, productivity and employment have a positive and significant effect on consumption wages (i.e., when CPI is used to measure real wages). When real wage is measured by GDP deflator, only productivity has a positive and significant effect on real wages. Meanwhile, no relationship among productivity, employment on product wages (i.e., when PPI is used). In the short-run, productivity and wages have a positive and negative effect on employment, respectively. In the long-term, a one per cent increase in productivity results in only at a most 0.45 per cent increase in real wages. This relationship is uni-directional from productivity to wages, thus consistent with the Marginal productivity theory of wages.

Table 2.1: Studies on the relationship between real wages, labour productivity, and unemployment in Malaysia (*continued*)

Studies	Data	Variables	Methodology	Results & Conclusions
Goh and Wong (2010) ***International Research Journal of Finance and Economics, vol.53***	Annual time-series data (1970-2005) in ten economic sectors[8] *Data Source*: The Productivity Council of Malaysia and DOSM.	*Endogenous*: log of real wages per worker *Exogenous:* log of productivity and log of unemployment.	The ADF and PP unit root test. The Johansen multivariate cointegration test. The ECM model by OLS regression.	A long-term equilibrium relationship between seems to exist between real wages and productivity for the period 1970-2005, but employment is not connected to the real wages and productivity. In the long-run, productivity has a positive and significant effect on wages. Real wages rise by 1.22 per cent for every one per cent rise in productivity. In the short-run, productivity has a positive impact on wages, but wages have no impact on productivity. The adjustment to equilibrium occurs through wages only but not productivity. The increase in real wages exceeds the increase in productivity leads to increase in unit labour cost, hence eroding the competitiveness of Malaysia as a centre of cheap labour and low-cost production.
Tang (2010) ***MPRA Paper No.24355 online at http://mpra.ub.uni-muenchen.de/24355.***	The monthly data from January 1983 to November 2009. *Data Source*: DataStream 4.0	*Endogenous*: log of productivity *Exogenous:* log of real wages, and its square.	The ADF unit root test. VECM model by the Johansen multivariate cointegration test and the Granger-causality test.	In the long-run, productivity has a positive and significant impact on real wages, and a negative and significant impact on the squared of real wages. Therefore, results support for the inverse-U shape relationship between wages and productivity in Malaysia that is productivity first increases with wages and declines thereafter. Contrary with the earlier studies, the real wage and productivity are granger-cause each other (i.e., bilateral causality) in the short- and long-run, and its support the efficiency wage theory.

[8] Ten economic sectors, namely: manufacturing, utilities, transportation, finance, government services, wholesale and retail trade, agriculture, construction, mining, and other services.

Secondly, in terms of their scope and timespan, Goh and Wong (2010) have a few key points in their favour compared to others. This is because their study covered all sectors of the Malaysian economy. They also dealt with a longer period of time (around 35 years, i.e. from 1970 to 2005). Meanwhile, studies by Ho and Yap (2001) and Yusof (2008) only dealt with the manufacturing industries. Moreover, Ho and Yap (2001) and Yusof (2008) only covered a period of 22 years (from 1975 to 1997) and 13 years (from 1992 to 2005), respectively.

Thirdly, in terms of the data used, unlike others, Yusof (2008) utilized quarterly data rather than yearly data. Moreover, Yusof (2008) used three different measurements of real wages rather than one proxy. Yusof's study examined the relationship of productivity and employment to the real consumption wage, the real product wage, and the real wage using GDP deflator separately. He also used two different measurements to proxy the productivity, namely, value added per worker and real GDP per capita. It would be interesting to discuss in more detail the studies of Goh and Wong (2010) and Yusof (2008) before highlighting some of their drawbacks. These two studies are chosen because one study supports the hypothesis that the elasticity of wages with respect to productivity is unitary (Goh and Wong, 2010), while the other rejects that hypothesis (Yusof, 2008).

Goh and Wong (2010) re-examined the relationship between real wage and productivity (denoted by *w* and *p* respectively) using a longer dataset (i.e. 35 years or from 1970 to 2005) and different sources of data obtained from the Malaysian Productivity Council (MPC). They utilized the real consumption wages per worker as a dependent variable, measured by the average nominal wages in 10 economic sectors (i.e. manufacturing, utilities, transportation, finance, government services, wholesale and retail trade, agriculture, construction, mining, and other services) and deflated by the consumer price index. The other two variables used were average productivity (measured by real GDP per worker) and the unemployment rate (denoted by u). All variables were in logarithms to ensure they are unit-free and to reduce any nonlinearities. The ADF and Phillips Perron unit root tests (with the assumption that there is no structural break) revealed that all series are I(1). The co-integration equations imposed the assumptions of a linear deterministic trend and intercept, and assumed away structural breaks, i.e.

$$w_t = \mu_0 + \mu_1 t + \beta_p p_t + \beta_u u_t + \varepsilon_t \qquad \textbf{2.1}$$

where ε_t is an I(0) random residual and that theoretically we expect $\beta_p > 0$ and $\beta_u < 0$.

The Johansen co-integration test confirmed that there exists at least one co-integrating relationship among the three variables. The estimated coefficients were $\hat{\beta}_p$ =1.28(.054) and $\hat{\beta}_u$ =0.06(0.051), with the standard errors in parentheses. Estimates of the corresponding Error Correction equations[9], i.e.

$$\Delta w_t = \phi_{w0} + \sum_{i=1}^{n} \alpha_{wi} \Delta w_{t-i} + \sum_{i=1}^{n} \alpha_{pi} \Delta p_{t-i} + \sum_{i=1}^{n} \alpha_{ui} \Delta u_{t-i} + \gamma_w \hat{\varepsilon}_{t-1} + v_{wt} \qquad \textbf{2.2}$$

[9] The corresponding model in this study eliminates unemployment from the short-term specification. This is because the Johansen co-integration test had suggested that unemployment is insignificant and is therefore not part of the long-term relationship.

$$\Delta p_t = \phi_{p0} + \sum_{i=1}^{n} \delta_{wi} \Delta w_{t-i} + \sum_{i=1}^{n} \delta_{pi} \Delta p_{t-i} + \sum_{i=1}^{n} \delta_{ui} \Delta u_{t-i} + \gamma_p \hat{\varepsilon}_{t-1} + v_{pt} \qquad \textbf{2.3}$$

$$\Delta u_t = \phi_{u0} + \sum_{i=1}^{n} \theta_{wi} \Delta w_{t-i} + \sum_{i=1}^{n} \theta_{pi} \Delta p_{t-i} + \sum_{i=1}^{n} \theta_{ui} \Delta u_{t-i} + \gamma_u \hat{\varepsilon}_{t-1} + v_{ut} \qquad \textbf{2.4}$$

implied that productivity impacts real wages positively in the short term when the 4th lag of productivity term in the real wage equation was positive and statistically significant (i.e. estimates of α_{pi} are jointly significant and add up to a positive magnitude). As explained in Feldstein (2008), the long lags would suggest that changes in productivity were not fully reflected in real wages immediately. On the other hand, the productivity equation implied that real wage does not have any effect on productivity in the short term since the lags in real wages and productivity are all insignificant in that equation.

To sum up, Goh and Wong (2010) showed that there exists a long-term relationship between real wages and productivity in Malaysia from 1970 to 2005; whereas, unemployment has a negligible effect on real wages (and the sign is positive, thus inconsistent with economic theories). In the special case of Cobb-Douglas technology, the marginal product of labour is proportional to the average product of labour, which is known as productivity. Profit maximization suggests that the marginal product factor should be equal to its real cost. The real cost of labour is the real wage. Hence, the wage paid by competitive firms should rise at the same rate as the rise in productivity, i.e. elasticity should equal unity. In this study, the hypothesis that elasticity of wages with respect to productivity amounts to unity is not rejected.

Yusof (2008) examined the short- and long-term relationship between real wage, productivity and employment. Yusof's study used quarterly data from 1992:1 to 2005:3 for selected manufacturing industries. Other than using the quarterly data, Yusof's study differed from other studies in having used three different measurements of real wages and two different proxies for productivity. The real consumption wage (denoted by *wc*) and real product wage (denoted by *wp*) are computed by deflating nominal wages through CPI and PPI, respectively. Another measure of real wage is obtained using the GDP deflator (denoted by *wg*). Meanwhile, the ratio of manufacturing output to the number of employees as well as the real GDP per capita are used as proxies for productivity (denoted by *p* and *pg*, respectively). Another explanatory variable is the number of employees used as a proxy for employment (denoted by *e*). The ADF, PP and KPSS unit root tests suggested that all series are I(1). The cointegration equations imposed the assumptions of unrestricted intercept and no trend, i.e.

$$wc_t = \alpha_1 + \beta_1 p_t + \mu_1 e_t + \varepsilon_{1t} \tag{2.5}$$

$$wp_t = \alpha_2 + \beta_2 p_t + \mu_2 e_t + \varepsilon_{2t} \tag{2.6}$$

$$wg_t = \alpha_3 + \beta_3 p_t + \mu_3 e_t + \varepsilon_{3t} \tag{2.7}$$

$$wc_t = \alpha_4 + \beta_4 pg_t + \mu_4 e_t + \varepsilon_{4t} \tag{2.8}$$

$$wp_t = \alpha_5 + \beta_5 pg_t + \mu_5 e_t + \varepsilon_{5t} \tag{2.9}$$

$$wg_t = \alpha_6 + \beta_6 pg_t + \mu_6 e_t + \varepsilon_{6t} \tag{2.10}$$

where ε_{1t} to ε_{6t} are I(0) random residuals and that theoretically we expect $\beta_i > 0$ and $\mu_i < 0, i = 1,...,6.$

The Johansen co-integration test confirmed that the variables are co-integrated if *wc* and *wg* are used in the equation. However, no relationship is found among the variables if *wp* is used. The long-term equation with *wc* would indicate that the impact of both productivity and employment was positive and statistically significant in the long run. However, the equation with *wg* showed that only employment is positive and statistically significant in the long run. The estimated coefficients were $\hat{\beta}_1$ = 0.450 (0.066) and $\hat{\mu}_1$ = 0.446 (0.041) for equation 2.5, and $\hat{\beta}_3$ = 0.075 (0.092) and $\hat{\mu}_3$ = 0.395 (0.056) for equation 2.7, with the standard errors in parentheses[10]. The results support the theory of a positive relationship between real wages and productivity in the long run for both equations. However, the results do not support the theory of an inverse relationship between real wages and employment in the long run for both equations (i.e., $\mu_1 > 0, \text{and}\, \mu_3 > 0$).

The corresponding Error Correction equations were specified as in the following, where equations 2.1 – 2.13 are based on 2.5, while 2.14 – 2.16 are based on 2.7[11] – with *i* denoting the optimal lag length.

$$\Delta wc_t = a_1 + \sum_{i=1}^{n} \lambda_{1i} \Delta wc_{t-i} + \sum_{i=1}^{n} \theta_{1i} \Delta p_{t-i} + \sum_{i=1}^{n} \psi_{1i} \Delta e_{t-i} + \gamma_{11} \hat{\varepsilon}_{t-1} + v_{1t} \qquad \textbf{2.11}$$

$$\Delta p_t = a_2 + \sum_{i=1}^{n} \lambda_{2i} \Delta wc_{t-i} + \sum_{i=1}^{n} \theta_{2i} \Delta p_{t-i} + \sum_{i=1}^{n} \psi_{2i} \Delta e_{t-i} + \gamma_{21} \hat{\varepsilon}_{t-1} + v_{2t} \qquad \textbf{2.12}$$

$$\Delta e_t = a_3 + \sum_{i=1}^{n} \lambda_{3i} \Delta wc_{t-i} + \sum_{i=1}^{n} \theta_{3i} \Delta p_{t-i} + \sum_{i=1}^{n} \psi_{3i} \Delta e_{t-i} + \gamma_{31} \hat{\varepsilon}_{t-1} + v_{3t} \qquad \textbf{2.13}$$

[10] The estimated coefficients for equations 2.6, 2.8, 2.9, and 2.10 were not discussed in this study.
[11] Yusof (2008) did not consider the error correction equations with real product wage because the Johansen cointegration test suggested that no cointegrating relation was present in that case.

$$\Delta wg_t = b_1 + \sum_{i=1}^{n} \phi_{1i} \Delta wg_{t-i} + \sum_{i=1}^{n} \delta_{1i} \Delta p_{t-i} + \sum_{i=1}^{n} \varphi_{1i} \Delta e_{t-i} + \eta_{11} \hat{\varepsilon}_{t-1} + \omega_{1t} \qquad \textbf{2.14}$$

$$\Delta p_t = b_2 + \sum_{i=1}^{n} \phi_{2i} \Delta wg_{t-i} + \sum_{i=1}^{n} \delta_{2i} \Delta p_{t-i} + \sum_{i=1}^{n} \varphi_{2i} \Delta e_{t-i} + \eta_{21} \hat{\varepsilon}_{t-1} + \omega_{2t} \qquad \textbf{2.15}$$

$$\Delta e_t = b_3 + \sum_{i=1}^{n} \phi_{3i} \Delta wg_{t-i} + \sum_{i=1}^{n} \delta_{3i} \Delta p_{t-i} + \sum_{i=1}^{n} \varphi_{3i} \Delta e_{t-i} + \eta_{31} \hat{\varepsilon}_{t-1} + \omega_{3t} \qquad \textbf{2.16}$$

Estimates of equations 2.12 and 2.15and the application of the Granger non-causality test implied that real wages and employment do not have any effect on productivity since all of the lagged explanatory variables were insignificant. Meanwhile, equation 2.13 implied that productivity has a positive effect whereas the wage rate has a negative effect on employment in the short term. In this equation, the estimated coefficients were θ_{3i} = 0.307 (3.367) and ψ_{3i} = -0.280 (-2.285), where i = 1 and standard errors in parentheses. However, equation 2.16 implied that productivity alone has positive effects on employment in the short term, i.e. estimated δ_{3i} = 0.335 (3.604), where i = 1 and standard errors in parentheses[12]. Equations 2.11, 2.14 and 2.16 showed that the negative error correction term is significant. This indicated that an adjustment to equilibrium would occur negatively through real wages and employment in the long run.

To sum up, according to Yusof (2008), the Malaysian data suggest that a long-term relationship exists between real wages, real productivity, and employment. Yusof’s study finds that, in the long run, a one percent increase in productivity results in only

[12] In any case, this study also used another proxy for productivity – real GDP per capita – and yielded similar results.

a 0.45 percent increase in real wages. This finding is thus consistent with the marginal theory of wages already discussed. However, the theory that real wages inversely affect employment is not supported.

Ironically, there are several shortcomings to be pointed out with respect to the studies by Yusof (2008) and Goh and Wong (2010). Firstly, these studies assumed a monotonic, linear and positive relationship between real wages and productivity. Nonetheless, the labour supply perspective noted that the initial increase in wages would result in the employee becoming more productive (i.e. substitution effect outweighed income effect) because an increase in wages makes leisure more expensive, while a further increase in wages will decrease productivity because as workers become richer, they are able to afford more leisure (i.e. income effect outweighed substitution effect). In microeconomics theory, workers are assumed to maximize their utility function, which depends on the choice between income and leisure. However, their working hours are tied to their options. As wages rise, workers will work more hours to take advantage of the higher wages (more time will be allocated to working). Thus, the wage elasticity of labour supply is positive. This situation continues until workers have reached the point where their marginal utility of leisure outweighs their marginal utility of income. At this point, workers allocate less time to working. Hence, the wage elasticity of labour supply becomes negative. In light of the empirical evidence, the linear long-term relationship between wages and productivity is rejected on the basis of a nonlinear long-term relationship in Turkey (Bildirici and Alp, 2008). Meanwhile, in the Malaysian context, Tang (2010) found that productivity and real wages have a quadratic relationship (i.e. inverse-U shape curve) in the long run instead of a linear relationship. Thus, offering higher wages does not always lead to higher productivity.

Secondly, the aforementioned studies also assumed that the causal relationship is unilateral, running from productivity to wages. However, it is just as plausible to have a reverse causation from wages to productivity, as noted by Akerlof and Yellen (1986). The efficiency wage hypothesis states that wages, at least in some markets, are not determined only by demand and supply. It points to the incentive for employers to pay their employees more than the market clearing wage rate in order to increase labour productivity. Arkelof and Yellen (1986) identified four benefits of higher wage payments: (1) fewer shirking of work by employees due to the higher cost of job loss; (2) minimizing turnover; (3) improvement in the average quality of job applicants; and (4) improved morale. Empirically, in the case of Malaysia, Tang (2010) found that real wages and productivity are due to a bilateral instead of unilateral causality in the short and long term. This implies that in the short and long run, productivity affects wages and vice-versa. Hence, the marginal productivity and efficiency wage theories appear valid for Malaysia.

2.5.2 Studies on pay structure

Empirical studies on the wage structure have tried to explain the various structures or patterns of wages in the Malaysian economy. Such structure occurs due to the differentials created by industry, occupation, geography, race, gender, and groups. Most of the empirical studies on wage structure in Malaysia have focused on gender and race differentials, while only a few studies have examined inter-industry differentials.

The second category of studies on wages examined the wage differentials in Malaysia. A good number of researchers such as Chapman and Harding (1985), Lee and Nagaraj (1995), Mohd-Nor (1998), Schafgan (1998, 2000), Mohamad-Nor (2000), and Fernandez (2009) have focused on the gender wage gap in Malaysia over the last thirty years. These studies have mostly concentrated on: (i) measuring the magnitude of the gender wage gap in the Peninsular Malaysia using the regression analysis by Ordinary Least Square (OLS) on the standard human capital model; (ii) examining the extent to which discrimination against women exists in the Malaysian labour market using the wage decomposition model by Oaxaca and Ransom (1994). Table 2.2 describes the data, variables, methodology, and findings by these studies. Most empirical studies on gender wag gap utilized a cross-section at individual level data from various sources. Almost all studies on gender wag gap at the individual level found that men earn more than women. These gaps arise in part due to productivity differences, discrimination in the labour markets, some of which may be traced to past discrimination in education and in the labour market.

Chapman and Harding (1985) were pioneers in studies on gender wage differentials in Malaysia. They utilized a cross-section at individual level data collected from a survey of ex-students of the Mara Institute of Technology[13] in their estimating equation, i.e.

[13] The Mara Institute of Technology is one of the higher educational institutions in Malaysia. The survey was undertaken in 1979 by the Economic Planning Unit (EPU) of Malaysia.

$$w_i = \beta_0 + \beta_1 edu_i + \beta_2 \exp_i + \beta_3 \exp_i^2 + \beta_4 Z_i + \varepsilon_i \qquad \textbf{2.17}$$

where, for individual *i*, *w* is the log of monthly wages plus one-twelfth of fixed annual bonus, *edu* is years of schooling, *exp* is length in the labour force, and *Z* is a vector which includes other wage determinants such as ability measure, marital status, and occupational dummy. Equation 2.17, including sex dummy variable, was estimated for the whole sample, and also for men and women separately. The results show that an additional year of schooling adds between five and nine percent to the wages, while an additional year of experience has worth in the order of 11 to 15 percent. Failing a course (measure for ability) was associated with a 13 to 30 percent reduction in wages, while being married was associated with a six to twelve percent rise in wages. The average monthly wages calculated from the separate regression for men and women were the following: men earned RM1022, women earned RM738. This revealed that the gender wage gap exists in Peninsular Malaysia, as women earned only 71 percent of men’s earning.

Table 2-2: Studies on the gender earning gap in Malaysia

Studies	Data	Variables	Methodology	Results and Conclusions
Chapman and Harding (1985) ***Journal of Development Studies, vol.21, no.3***	A cross-section data in 1979 *Data Source*: A 1979 survey of ex-students of the Mara Institute of Technology.[14] *No. of obs.*: - 356 men - 249 women	*Endogenous*: monthly wages *Exogenous:* gender, marital status, education, work experience, and ability.	Reduced form and structural estimates by OLS based on Blinder (1974).	This study found that less than a third of the average monthly wage difference between the sexes of about 34 per cent The most important factor for determining gender-wage differences is the difference in employment distributions of men and women, whereby women tend to be in low-paying jobs and thus earn less than men for the same human capital endowments.
Lee and Nagaraj (1995) ***Journal of Development Studies, vol.31, no.3***	*Data Source*: A 1991 survey of employees in the manufacturing sector of Malaysia's Klang Valley.[15] *No. of obs.*: - 1434 employees from 120 firms	*Endogenous:* monthly earnings *Exogenous:* education, experience, occupation, training, union membership, total hours worked, ownership, export-orientation, size of firm, marital status, and migration.	The regression analysis by OLS based on Oaxaca (1973).	The most important factor for determining gender-wage differences is the difference in employment distributions of men and women, whereby women tend to be in low-paying jobs and thus earn less than men for the same human capital endowments. Differences in productive endowments account for only about 54 per cent of the monthly earnings differential in Malaysia. Returns to experience are higher for men compared to women.
Mohd-Nor (1998) ***IIUM[16] Journal of Economics and Management, vol.6, no. 1***	*Data Source*: The Second Malaysian Family Life Survey (MFLS-2) in 1988.[17] *No. of obs.*: - 4566 male - 2476 female - Peninsular Malaysia.	*Endogenous*: monthly earnings *Exogenous*: experience and its square, value of weekly working hours, dummy for English as a medium of instruction schooling, dummy for 9, 11, and 13 years of schooling, dummy for college degree or higher, number of children, marital status, and occupation dummy.	The human capital earnings equations estimated by OLS regression. The Oaxaca and Ransom (1994) wage decomposition equations.	This study found that in explaining the earnings differentials between the two genders, job discrimination is more important than human capital and family characteristics. It is because between 87.5 per cent and 93.9 per cent of gender earnings differentials were attributed to unexplained variables. The major source of discrimination is due to gender bias.

[14] The survey was undertaken by the institute and the Economic Planning Unit (EPU) of the Malaysian Prime Minister's Department (with the assistance of consultants from Harvard Institute for International Development).
[15] Malaysia, 1990, Industrial Surveys: *Construction, Manufacturing, Mining and Stone Quarrying*, 1988 Kuala Lumpur: Department of Statistics.
[16] International Islamic University Malaysia.
[17] The data collected by RAND Corporation and the National Population and Family Development Board of Malaysia.

Table 2.2: Studies on the gender earning gap in Malaysia *(continued)tinued*)

Studies	Data	Variables	Methodology	Results and Conclusions
Schafgan (1998) ***Journal of Applied Econometrics, vol. 13, no.5***	*Data Source*: The MFLS-2 in 1988 *No. of obs*.: - 2147 Malay women and 2023 Malay men. - 1298 Chinese women and 1190 Chinese men.	*Endogenous*: log of hourly wage, dichotomous wage worker *Exogenous*: household income, house ownership, land ownership, age, primary schooling, secondary schooling, potential experience, failure, and urban.	The parametric and semi-parametric estimation of wage functions. The Oaxaca (1973) wage decomposition technique.	This study found that returns to education increased among all ethnics for both sexes. In addition, the differences between wages offered to Chinese and Malays were significantly higher for women than men.
Schafgan (2000) ***Journal of Development Economics, vol. 63***	*Data Source*: The MFLS-2 1988 *No. of obs*.: 4575 women and 4173 men in Peninsular Malaysia.	*Endogenous*: log of hourly wage, dichotomous wage worker *Exogenous*: household income, house ownership, land ownership, age, primary schooling, secondary schooling, potential experience, failure, and urban.	The human capital earning functions by Mincer (1974) Parametric and semi-parametric estimation of wage functions. The Oaxaca (1973) wage decomposition technique.	This study found that discrimination among genders occurred for all ethnics in Peninsular Malaysia. The discrimination favouring men in Malaysia still quite prevalent, while for Malays the strong level of discrimination favouring Malay men is negated by the semiparametric estimation results.
Mohamad- Nor (2000) ***Journal Pengurusan, vol. 19***	*Data Source*: A cross-section data from the MFLS-2 1988 *No. of obs*.: 300 professional women and 521 men, 344 clerical women and 283 men, 304 sales women and 530 men, 336 service women and 507 men, 517 manual women and 1205 men.	*Endogenous*: log of monthly earnings *Exogenous*: work experience and its square, log value of weekly working hours, dummy for English as a medium of instruction schooling, dummy for 9, 11, and 13 years of schooling, and dummy for college degree or higher.	Standard human capital model using OLS. OLS regression by major occupational categories (i.e., professional, clerical, service, sales, and manual) for both gender groups. Wage decomposition model by Oaxaca and Ransom (1994).	The most important factor for determining gender-wage differences is the difference in employment distributions of men and women, whereby women tend to be in low-paying jobs and thus earn less than men for the same human capital endowments. The earnings gap seems to be smallest in clerical occupations, which has the highest percentage of women, and this gap is largest in occupations with smallest percentage of women, such as sales. Besides differences of endowments factors, discrimination also plays an important role that affects gender earnings differentials within each occupation.

Table 2.2: Studies on the gender earning gap in Malaysia (*continued*)

Studies	Data	Variables	Methodology	Results and Conclusions
Ismail and Mohd-Nor (2005) ***IIUM Journal of Economics and Management, vol.13, no.2***	*Data Source*: A cross-section data in 1999. A survey of workers in six major industries[18] in the two main industrial areas (i.e., The Klang Valley, and Penang). *No. of obs*.: 2046 workers at the production level (1221 males and 825 females).	*Endogenous*: log of monthly wages *Exogenous*: demographic variables (age, age^2/100, and four ethnic groups); human capital variables (tenure, tenure^2/100, school, school^2/100, and two categories of on-the-job training); job characteristics (contract, full-time, part-time, skilled, semi-skilled, unskilled); industry characteristics (electric and electronic, textile, wood and furniture, transportation equipment, foods, and chemicals).	First model consists of three wage equations, i.e., (i) all male and female, (ii) only male, and (iii) only female, estimated by OLS. Second model used the Oaxaca and Ransom (1994) wage decomposition equation.	This study found that Malay workers have lower wages than their Chinese counterparts. Besides, educational attainment and skill training have a positive relationship with the wages level. Workers in more capital intensive industry received higher wages than those in the electrical and electronics industry, although textile industry workers received significantly lower wages. In addition, human capital and demographic factors played a greater role in determining wage differentials between genders.
Fernandez (2009) ***Journal Kemanusiaan, vol.4***	*Data Source*: A cross-section data in 1995. Household Income Survey.[19] *No. of obs*.: 467,765 employees.	*Endogenous*: log of annual earnings *Exogenous*: experience and its square, education levels dummy, log of weekly hours of work.	The standard human capital earnings model by Mincer (1974) using OLS regression. The wage decomposition model by Oaxaca and Ransom (1994).	This study revealed that in most cases, a greater portion of the earnings gap was explained by the discrimination factor, while some of the disparity was due to gender differences in education, experience, and hours of work.

[18] The six major industries were electric and electronic, textile, wood and furniture, transportation equipment, foods, and chemicals.
[19] The survey was carried out by the Department of Statistics, Malaysia.

Furthermore, about 34 percent of the average monthly wage gap between the two genders was due to either women having lower productivity than men, or women receiving lower rates of return on human capital than men. Women tend to end up in low-paying jobs which is regarded as one of the main factors for their lower average wage. In other words, the crowding of a large percentage of women in a limited number of occupations has a negative effect on their wages. This implied that the gender wage gap in Malaysia was attributable to the occupational crowding effect of labour market discrimination wherein females are crowded into low paying jobs.

Mohamad-Nor (1998) utilized a cross-section at individual level data from the Second Malaysian Family Life Survey (MFLS-2)[20] to measure the magnitude of the gender wage gaps and examine the extent of discrimination against women in Peninsular Malaysia. The human capital wage equations are estimated using the OLS, i.e.

$$w_i = \beta_0 + \beta_1 HK_i + \beta_2 FM_i + \beta_3 OC_i + \mu_i \qquad \textbf{2.18}$$

where, for individual *i*, *w* is log of monthly wages; *HK* represents a vector of human capital variables (i.e. dummy variables for different levels of high education, experience and experience^2, working hours and dummy for English as a medium of schooling); *FM* represents a vector of family variables (i.e. the number of children and marital status); *OC* represents a vector of occupational dummies for professional, administrative, clerical, sales, and service workers.

[20] MFLS-2 dataset collected by RAND Corporation in 1988.

The coefficients show that wage structures are different between genders, with males being more favored. All human capital variables significantly affect wages. Additional education and work experience produce higher returns for both genders. The returns on work experience for male workers is almost double that for female workers. In addition, the squared terms in experience indicated that the effect of an additional year of experience declined over time for both sexes. Furthermore, the presence of children has a significant and negative effect on women's wages but has no effect on men's wages, while being married appears to have a significant and positive effect on men's wages but with no significant impact on women's wages. Longer working hours generate higher earnings for all workers, with female ones receiving higher returns than males. In addition, English as medium of schooling has a significant and positive impact on both men's and women's wages, with men receiving higher returns than women. The coefficients for all occupational dummies are significant and have a positive effect on men's wages. For women, however, the coefficients for all occupations except services show a positive relationship with men's.

In addition, this study also determined the estimated cost of being female when regressing the following model:

$$w_i = \beta_0 + \beta_1 FEM + \beta_2 HK_i + \beta_3 FM_i + \beta_4 OC_i + \mu_i \qquad \textbf{2.19}$$

where FEM is a dummy for female workers. The predicted wages for female workers were about 55.6 percent of the men's wages without controlling for other factors. When a vector of human capital variables is included, the gross female-male wages ratio increases to 60.3 percent. The results imply that female workers benefit from getting a higher education, more experience, working longer hours, and having received an education in English. The female-male ratio increased to 59 percent when only family variables were included. This suggests that the cost of being a female worker is reduced slightly when married and having children. Meanwhile, when the regression is replaced by a vector of occupation categories, the results indicate that the ratio falls drastically to 52.4 percent. The figures indicate that job segregation increased the cost of being female. The inclusion of the occupation vector in the regression leads to decreases in the ratio to 59.4 percent, which confirms the results that job segregation is a key factor that widens the gender wage gap in Peninsular Malaysia.

The Oaxaca and Ransom (1994) wage decomposition equation is used to measure the endowment and discrimination components as well as the extent of discrimination in the labour market. The effects of discrimination are approximated by the residual left after subtracting the endowment effects from the overall gap. In an attempt to measure the extent of discrimination, the discrimination factor is further broken down into the male treatment advantage (MTA) or the amount by which male productivity is overvalued, and the female treatment disadvantage (FTD) or the amount by which female productivity is undervalued. These may be calculated as follows:

$$\ln \overline{w}_i^m - \ln \overline{w}_i^f = \sum \beta_i^* (\overline{x}_i^m - \overline{x}_i^f) + \sum \overline{x}_i^m (\beta_i^m - \beta_i^*) + \sum \overline{x}_i^f (\beta_i^* - \beta_i^f) \qquad \textbf{2.20}$$

where *m* and *f* represent the male and female sample, respectively; $\overline{x}^m$ and $\overline{x}^f$ are the average productivity-determining for male and female sample, respectively; β^m and

β^f are the OLS regression coefficients for the male and female sample, respectively; and β^* is a parameter that represents the return on characteristics that influence the wage differentials in the absence of discrimination.

The results from the decomposition wage equation showed that 13 percent of the wage gap was due to differences in the endowment characteristics. Meanwhile, the differences in returns on those characteristics, of which a large proportion of the discrimination component is attributable to overpayment of male workers, account for 87 percent of the gender wage gap. It was expected that about 11 percent of the wage differential on productive advantage has been enjoyed by male workers over female workers. When occupational categories are included in the model, it increased the discrimination components to 94 percent. These results further strengthen the findings whereby gender differences in the distribution by occupation is a key factor in widening the wage gap in Malaysia.

To sum up, Mohamad-Nor (1998) found that in explaining the earning differentials between the two genders, job discrimination is more important than human capital and family characteristics because between 87.5 percent and 93.9 percent of gender wage gaps were attributed to unexplained variables. This is consistent with the findings of Chapman and Harding (1985). Furthermore, the major source of discrimination is MTA rather than FTD, which implied that the gender wag gap was attributable to favouritism towards men. This study found that in 1988 the average monthly wage of women workers was 59 percent of that earned by men, which is lower than the findings by Chapman and Harding (1985).

Another group of studies discusses the relationship between the distribution of women and men in different occupations and its impact on the wage gap (e.g. Mohamad-Nor, 2000; Fernandez, 2009). Mohamad-Nor (2000) applied the same approach and model to the same data (as in previous studies) in order to examine the occupational effects on earnings of women in each major occupational category[21] and then compared their labour market outcomes to those of men. This study found that gender earnings differentials vary within occupations, which contributes to the overall gender wage gap. In addition, the wages of men and women are found to be lower in jobs held exclusively by women in clerical occupations than the wages of both genders employed in predominantly male occupations. This suggested that the higher percentage of women in an occupation has a negative effect on wages for that occupation. Furthermore, this study revealed that the wage gap seems to be smallest in clerical occupations, and largest in sales occupations. Hence, the distribution differences between men and women workers in the labour market also explain the gender wage gap in Malaysia.

Another study on the intra-occupational gender wage gap was carried out by Fernandez (2009), which used the micro cross-section dataset from the Household Income Survey (HIS) of 1995. This study examined the gender wage gap issues within nine occupational groups consisting of three types of worker domination[22]. This study

[21] The major occupational category comprises five groups, namely: Professional (which includes professional and administrative jobs), Clerical, Service, Sales, and Manual (which includes agriculture and production).

[22] The first four groups of workers, i.e. craft and related trade workers; agricultural and fishery workers; legislators, senior officials and managers; plant/machine-operator and assemblers, are male-dominated occupations. The fifth through to seventh groups, namely professionals; technicians and associate

revealed that, in most cases, a greater portion of the earnings gap was explained by the residual or discrimination factor, while some of the disparity was due to gender differences in education, experience, and hours of work. In addition, the discrimination factor in terms of the gender wage gap tends to be larger in male-dominated occupations than female-dominated and gender-integrated ones.

Other studies (Shafgans, 1998; 2000) concentrated on the ethnic wage differentials. These two studies used parametric and semi-parametric wage equations, which corrected the sample selection bias in the MFLS-2 dataset to estimate the returns on education and the extent of gender discrimination. In these studies, discrimination refers to that part of the wage gap that cannot be explained by differences in endowment as they emanate from discrepancies in the returns on wage-determining factors. The Andrews-Schafgans (1998) estimator is used to consistently estimate the wage equation intercept in a semi-parametric case.

Schafgan (1998) focused on the level of discrimination between Malay and Chinese men and women. This study claimed that returns on education increased among all ethnics for both sexes. In addition, the differences between wages offered to Chinese and Malays were significantly higher in absolute value for women than men, indicating a stronger female ethnic disparity. Furthermore, the decomposition results are not indicative of discrimination against Malays among men or women. These semi-parametrics are in contrast to the parametric evidence that is indicative of discrimination favouring Chinese over Malays, with Chinese men (and women)

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professionals; sales and service workers, are gender-integrated occupations. The last two groups, i.e. elementary workers and clerical workers, are female-dominated occupations.

receiving an unexplained premium between 23% and 27% (21% and 25%). Using the same data and applying the same approach as in previous, Shafgans (2000) examined the gender wage gap for all Malaysians and separately for Malays. This study found increasing returns on education among males and females in Malaysia, and separately among Malays as well. Regarding the issue of gender discrimination, women in Malaysia are discriminated but not among Malays. For all Malaysia, the extent of discrimination favouring men over women is between 63 to 68 percent.

Other studies concentrated on the wage differentials among employees in the manufacturing sector (e.g. Lee and Nagaraj, 1995; Ismail and Mohd-Nor, 2005). Lee and Nagaraj (1995) utilized data from a 1991 survey of employees in the manufacturing sector in the most industrialized and developed region of Malaysia, namely, the Klang Valley. The survey covered employees in eleven industries (i.e. electrical machinery, apparatus, appliances and supplies, textile, garments and leather, food, beverages and tobacco, wood and wood products, paper product and printing, fabricated metal products, and chemical products). This study found that about 46 percent of the male-female monthly pay gap in the Malaysian manufacturing sector may be attributable to the effects of discrimination. Discrimination occurs through favorable returns on hours worked, establishment characteristics, and experience of male workers. However, a large portion of the gap may be attributable to differences in human capital endowments. These results contradict Chapman and Harding (1985). Overall, women tend to be concentrated in subordinate occupations and appear to be paid less for similar human capital endowments, which is consistent with Chapman and Harding (1985).

Ismail and Mohd-Noor (2005) applied data from a 1999 survey of 2,046 workers in six major industries, namely: electrical and electronics, textile, wood-based, transport equipment, food, and chemical industries. They found that Malay workers have lower wages than their Chinese counterparts. Besides, educational attainment and skill training have a positive relationship with the wage level. Workers in more capital-intensive industries received higher wages than those in the electrical and electronics industry, even though textile industry workers received significantly lower wages. In addition, human capital and demographic factors played a greater role in determining the wage differentials between genders which contradicts Chapman and Harding (1995).

In summary, the gender wage gap may be due to the gap in individual productivity and labour market discrimination. This labour market discrimination may take various forms in terms of the same work. Female workers' tendency to be crowded in low-paying jobs is the main factor for their lower average wage. Job distribution of women and men does make an important difference in explaining their respective earnings. In addition, most of the discriminatory wage differentials were attributable to favourable male treatment rather than unfavourable female treatment. Furthermore, most of these studies revealed that job segregation also plays an important role in increasing the cost of being female.

Athukorala (2004) estimated an inter-industry wage growth model on data from 45 industries at the five-digit level of the SITC from 1976 to 1995. This study tests the postulated wage restraining effect of the presence of foreign-ownership and multinational enterprises in export-oriented industries on the manufacturing wage growth. The estimated model is as follows:

$$\begin{aligned} WG_{it} &= \beta_0 + \beta_1 fo_{it} + \beta_2 eo_{it} + \beta_3 foeo_{it} + \beta_4 inw_{it} + \beta_5 eg_{it} + \beta_6 fm_{it} + \beta_7 sz_{it} \\ &\quad + \beta_8 con_{it} + \beta_9 cap_{it} + \beta_{10} wsh_{it} + \beta_{11} pso_{it} + \beta_{12} uni_{it} + \mu_{it} \end{aligned} \qquad \textbf{2.21}$$

where *WG* is the average compound of real wage growth for industry *i* (*i* = 45) at time *t* (*t* =19). The independent variables (their sequence as in the above model) were the following: foreign ownership, export-orientation, an interaction for foreign ownership and export-orientation, initial wages, employment growth, female share, firm size, industry concentration, capital intensity of production, wage share in the production cost, public-sector ownership, and union density. According to the wage restraint hypothesis, $\hat{\beta}_1$ and $\hat{\beta}_3$ are expected to be negative and significant. However, the estimated coefficients were $\hat{\beta}_1$= 0.01 (0.69) and $\hat{\beta}_3$= 0.01 (0.82) for equation 2.21 – standard errors in parentheses. Therefore, when appropriately controlled for other determinants of inter-industry differences in the Malaysian manufacturing wage growth, the wage restraining hypothesis was rejected. There is no strong empirical evidence to suggest that the presence of foreign ownership and multinational enterprises in the export-oriented industries has a negative impact on real wage growth.

In addition, among the control variables, initial wages, export-orientation, and employment growth have a negative and significantly effect on real wage growth. The estimated coefficients were $\hat{\beta}_4$= -2.62 (4.60), $\hat{\beta}_2$= -1.79 (2.29) and $\hat{\beta}_5$= -0.06 (1.72) – standard errors in parentheses. The female share and capital intensity, however, have a positive and significant effect on real wage growth. The estimated coefficients were $\hat{\beta}_6 = 0.04$ (2.95) and $\hat{\beta}_9 = 0.43$ (1.43) – standard errors in parentheses. Furthermore, the firm size variable has the expected (positive) sign but insignificant due to inter-correlation with the capital intensity variable.

Athukorala and Devadason (2011) investigated the impact of foreign labour dependence on inter-industry wage differentials. This study utilized the Annual Survey of Manufacturing Industries' panel data at the five-digit level for the six-year period from 2000 to 2005[23]. They examined the postulated wage restraining effect of the presence of migrant workers on manufacturing workers via the following model:

$$WG_{it} = f\,(fwd_{it}, ro_{it}, cap_{it}, skl_{it}, sz_{it}, fo_{it}, eo_{it}, con_{it}, uni, dc) \qquad \textbf{2.22}$$

where the dependent variable is the log of real wage growth for industry *i* at time *t*, while the independent variables (their sequence as in the above model) were as follows: share of foreign workers in total employment (foreign-worker dependence), real output, capital intensity, skill intensity, average firm size, foreign ownership, export-orientation, industry concentration, trade union dummy, and the dot.com dummy. They estimated the above model using fixed effect (FE), random effect (RE) estimators, and then re-estimated by combining FE and RE estimators, each with the instrumental variable (IV) estimator. The FE estimator (preferred estimator) indicated that the coefficient of *fwd* has the negative sign in both total wage equation and

[23] This survey was conducted by the Department of Statistics Malaysia (DOSM).

unskilled-worker[24] equation. It is, however, insignificant statistically in the former, but highly significant in the latter. This provides empirical evidence of a statistically significant negative impact of foreign workers on the growth of unskilled-worker wages. The magnitude of the impact is rather small, as there is only a 1.4 percent decline in real wages for a 10 percent increase in the degree of foreign worker dependency. Among the control variables, the coefficients of *ro, cap, skl* and *sz* are highly significant, with the expected signs in both total workers and unskilled-worker equations. The estimated degree of elasticity of real wage with respect to each of these variables is much larger compared to that with respect to *fwd*. Thus, there is strong evidence for the proposition that factors closely related to manufacturing performance and industrial structure are much more important compared to foreign worker dependence in explaining real wage behaviour.

In addition, there is no statistical evidence for the hypothesis that greater export-orientation is associated with lower wages. At the same time, there is only weak evidence for the hypothesis that foreign firms tend to pay higher wages compared to their local counterparts. Furthermore, this study found that workers in industries where trade unions are prohibited on average earn 11.3 percent (for all workers) and 21.7 percent (for unskilled workers) less than their counterparts in other industries.

In summary, the studies on inter-industry differentials in the Malaysian manufacturing industries revealed that factors such as real output, capital intensity, skill intensity,

[24] Production workers and operatives who earn less than RM2500 per month are defined as unskilled workers, whilst professional and managerial workers who earn more than RM2500 per month are treated as skilled workers.

average firm size, and female share all have a significant and positive impact on the real wage growth. Meanwhile, export-orientation, initial wages, employment growth, and union density all have a negative impact on real wage growth. In addition, the presence of foreign multinational enterprises in the export-oriented industries has no significant impact on the real wage growth. Meanwhile, foreign-labour dependence has a significant and negative impact on the growth rate of real wages for unskilled workers in the Malaysian manufacturing industries.

2.6 Conclusion

This chapter reviews the theoretical and empirical literature regarding the determinants of a worker's pay. This theoretical and empirical review primarily intends to provide the foundations and motivations for determinants of pay with regard to the Malaysian economy.

In general, theories of wages have been broken down into three broad categories, namely, historical, contemporary, and alternative theories of wages. These theories have evolved due to changes and development in the labour market. The historical theory of wages seems to determine wages based on either the supply- or demand-side of the labour market. In contrast, contemporary and alternative labour market theories determine wages by considering both the demand- and supply-side of the labour market. Nevertheless, contemporary and alternative labour market theories differ as the former theory makes use of the assumption of a perfect competition labour market, while the latter makes use of the assumption of an imperfect competition labour market.

In literature on labour economics, there exist many different theoretical models to explain wage setting. However, not all of these are of empirical relevance, and we shall try to single out those that are relevant to a country like Malaysia. Our review points to the human capital theory as the most important and dominant economic theory of pay determination and differentials in Malaysia. Besides, it is interesting to specify and estimate a pay model (e.g. monopsony model) for the Malaysian economy which allows for market imperfections.

From the empirical perspective, pay determinants can generally be divided into three groups: firstly, individual worker characteristics; secondly, job characteristics; and thirdly, employer or firm characteristics. Individual worker characteristics refer to human capital variables such as education, experience and tenure. Job characteristics usually include the type of job, the hierarchical position of the worker, functional area, and region. Employer characteristics are often proxy by firm dummies or main indicators such as employer size or the number of employees, sales, profit, and net income.

Most previous studies on pay structure in Malaysia seem to assume that Malaysia's labour market is perfectly competitive. To fill this gap, in this study, I will put to the test the notion that Malaysia's labour market is monopsonistic and in line with what has been documented in Manning (2003a). In addition, this study will try to add some other labour market variables, namely, workers' performance, capital stock, regional variation, openness, governance, and firms' performance – all of which I consider variables that might explain the determinants of workers' pay in selected sectors of the Malaysian economy such as manufacturing, at least at the micro-economic level. The objective of this study is to address specific questions relating to how the worker's pay is affected by those factors. Interestingly enough, this study is different from previous studies partly because it uses firm-level instead of industries-level data.

In previous decades, many studies have analysed the determination of pay based on the perfect competition perspective. To date, however, it has been increasingly recognized that pay determination is best analysed from the perspective that there is some degree of imperfect competition in the labour market. In that regard, recent empirical studies have tied pay closely to individual employee characteristics (e.g. human capital, and gender), as well as employer characteristics (e.g. firm size, productivity, and profitability) by utilizing the matched employee-employer dataset, and have shown that both employee and employer characteristics play important roles in determining the worker's pay. This type of research has mainly focused on developed countries such as France, Sweden, Portugal, Belgium, and the United States. Due to data limitations, however, far less attention has been paid to developing countries such as Malaysia. To fill this gap, this study also explores the role of employer-employee specific effects on pay determination in the Malaysian labour market.

CHAPTER 3 : MALAYSIAN LABOUR MARKET AND PAY

3.1 Introduction

In Malaysia, the growth of wages is closely related to economic growth and labour market conditions. For that reason, this chapter provides an overview of the Malaysian economy, as well as the labour market and wages as a necessary background to the chapters that follow.

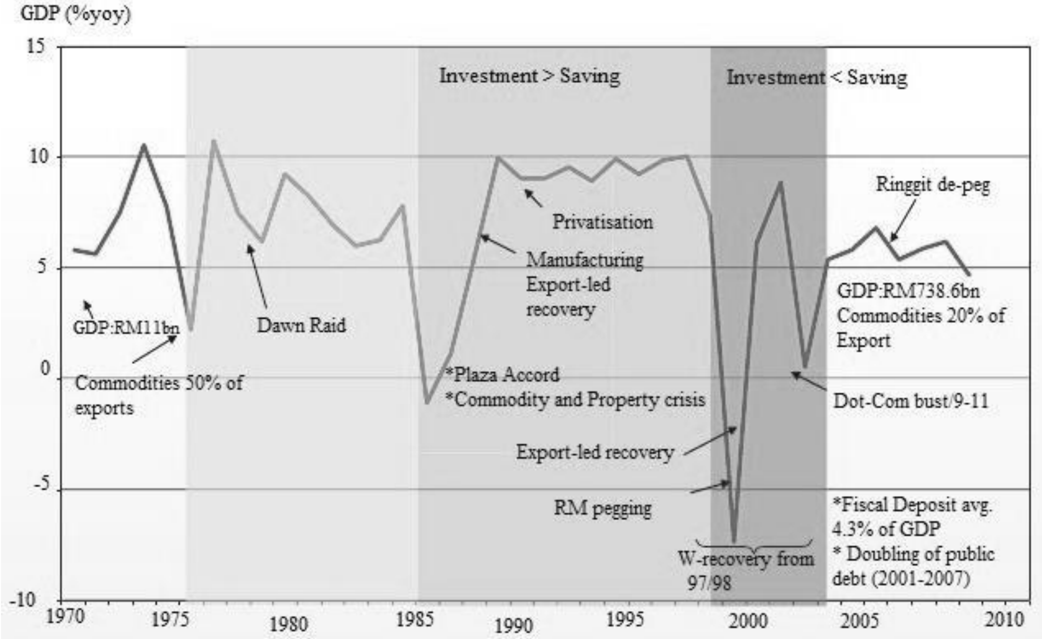
This chapter is set out as follows. Section 3.2 introduces the background to the Malaysian economy by reviewing Malaysia's economic performance and its labour market development. This will then be followed by section 3.3 which generally explores the contributions of the manufacturing sector towards the Malaysian economy. Next, in section 3.4, the wage system and wage trends in Malaysia will be discussed. In addition, some issues and challenges to the Malaysian labour market will also be discussed in section 3.5. Finally, section 3.6 summarises the chapter and highlights several conclusions.

3.2 Malaysian economy and its labour market development

Malaysia is an upper-middle-income South East Asian country, a highly open society with a newly industrialized market economy. Malaysia is made up of 11 states that are spread out over Peninsular Malaysia, Sabah, and Sarawak. As a diverse society, Malaysia has a multi-ethnic, multi-cultural, and multi-linguistic population. In 2009, its population was about 27.9 million, consisting of Malays (49 percent), Chinese (23 percent), Indians (7 percent), other Bumiputera (11 percent), and Others that include non-citizens (10 percent). In the early 1950s, Malaysia was a commodity-based economy which heavily relied on the exports of primary commodities such as rubber and tin. But Malaysia has since transformed itself especially in the 1970s towards a more diversified and multi-sector economy based on services and manufacturing, thereby achieving industrialisation at a faster rate than other Asian countries (ADB, 2011). Recently, Malaysia has become an export-driven economy spurred on by high-technology, knowledge-based, and capital-intensive industries (BNM, 2013).

Since its independence in 1957, Malaysia's economic performance has been one of the fastest among developing countries, and one of the most resounding in Asia. According to the Commission on Growth and Development (2008), Malaysia achieved a spectacular performance from 1967 to 1997 when it became one of 13 countries that have recorded an average growth of more than 7 percent per year for a period of 25 years or longer. Since 1970 and until the recent Asian financial crisis, Malaysia's GDP growth has 'hit' the 10 per cent mark on four occasions, i.e. 1973, 1977, 1989, and 1997 (see Figure 3.1). However, there were several temporary economic downturns which began with the first energy crisis in 1973-1974, followed by the second energy crisis in 1978-1979. The global downturn in the demand for primary commodities and electronics then followed from 1985 to 1986. Then, in 1997 to 1998 came the Asian financial crisis, which was followed by the dot-com crash in 2000-2002 (NEAC, 2009).

Figure 3.1 : Malaysian Growth Cycles



Source: *NEAC (2009)*

Malaysia has managed to maintain high growth rates over the three and half decades from 1970 to 2005, with an average annual growth rate in real GDP of about 7 percent, and that despite the crisis which severely affected its economy (Henderson et al., 2002; EPU, 2001). During this period, the performance of its economy peaked in the early 1980s through to the mid-1990s, as the economy experienced sustained rapid growth averaging almost 8 percent per annum (EPU, 1990). As a result, Malaysia emerged in 2008 as the third largest economy in South East Asia and 30th largest economy in the world in terms of purchasing power parity (PPP), with a gross domestic product (GDP) of US$222 billion (EPU, 2010). Nevertheless, in 2009, Malaysia's per capita GDP reached US$14,900 billion and is still growing sustainably at around 5 to 7 percent towards its target of becoming a high income economy by 2020. According to the Tenth Malaysia Plan or 10MP (2011-2015), Malaysia needs to achieve an annual average GDP growth rate of 6 percent during the 10MP period if it is to achieve this target.

Apart from a rapid growth in GDP, Malaysia also experienced significant changes in terms of the labour market. The improvement in labour market conditions was reflected in lower retrenchments, and a higher number of vacancies and gains in employment. As shown in Table 3.1, retrenchments declined by 72 percent from 25,064 persons in 2009 to 7,085 persons in 2010, due mainly to significantly fewer layoffs in the manufacturing sector. Vacancies posted on the JobsMalaysia Portal[25] increased to 1.8 million positions in 2010 compared to 1.5 million positions in 2009, due in part to expansion in the export- and domestic-oriented industries. The unemployment rate declined to 3.2 per cent of the labour force (2009: 3.7%), following stronger growth in employment (1.8%; 2009: 0.4%), and growth in the labour force (1.3%; 2009: 0.8%) MOF (2010).

Labour productivity, as measured by real value-added per worker, grew strongly by 5.8 per cent, reversing the negative growth of 2.1 per cent in 2009. Growth was underpinned by strong productivity growth in the manufacturing (9.5%) and services (5%) sectors. Gains in productivity were supported by higher investment in capital, greater participation by high-skilled workers and skills-upgrading through technical training schemes provided by the government and the private sector (BNM, 2010).

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[25] JobsMalaysia Portal is an automated online job matching system provided by Malaysia's Ministry of Human Resources.

Table 3-1 Selected Malaysian Labour Market Indicators, 2006-2011

	2006	2007	2008	2009	2010p	2011f
Labour Force (million persons)	11.5	11.8	12.0	12.1	12.2	12.5
Annual change (%)	2.2	2.6	1.7	0.8	0.8	2.5
Employment (million persons)	11.2	11.4	11.6	11.6	11.8	12.1
Annual change (%)	2.2	1.8	1.8	0.0	1.8	2.5
Unemployment Rate (%)	3.3	3.2	3.3	3.7	3.2	3.2
Retrenchments (persons)	15,360	14,035	24,033	25,064	7,085	-
New Vacancies (million)	0.837	0.825	1.059	1.546	1.787	-
Real labour productivity growth (%)	3.3	4.2	3.1	-2.1	5.8	-
Real wage per employee in the manufacturing sector (% change)	-1.4	2.2	-4.8	1.9	6.4	-

Notes: p – preliminary; f – forecast
Source: *BNM; EPU, Ministry of Human Resources*

Although the short-term economic growth has gained some momentum, serious concerns have been expressed with respect to the country's intermediate- and longer-term growth prospects. The Malaysian growth momentum over the last decade has been relatively weak which was attributed to low private investment that fell from an average of about 25 per cent of GDP pre-Asian financial crisis to an average of about 10 per cent of post-crisis GDP. This is aggravated by the shortage of professional and skilled workers as well as declining labour productivity growth (MOF, 2010). Therefore, Malaysia is seen to be trapped in a low-value-added, low-wage, and low-productivity structure (Kanaphaty, 2010).

As an open economy, Malaysia's rapid and impressive economic growth since 1970 has been closely related with international trade, and the rapid expansion of the manufacturing sector resulting from its industry development policies (Athukorala and Menon, 1997; UNDP, 2005)[26]. The manufacturing sector has contributed significantly

[26] These policies include an outward-looking industrialization strategy and encouragement for export-platform industries.

to Malaysia's economic development in terms of its contribution to the country's GDP and exports growth, producing more jobs and increased employment rate, as well as creating new investment opportunities in Malaysia.

3.3 Contribution of the manufacturing sector to the Malaysian economy

The decade of the seventies (1971-1980) witnessed rapid growth and substantial structural transformation in the Malaysian economy. During this decade, the manufacturing sector outperformed the rest of the economy by growing at an annual average rate of 11.4 percent compared with the GDP's annual growth rate of 7.8 per annum, resulting in a growing per capita income (EPU, 1980). The rapid growth in the Malaysian manufacturing sector enabled it to make a significant contribution to GDP growth. Table 3.2 shows the share of GDP (%) by sector (1970 – 2005). The GDP share of the manufacturing sector has risen from a mere 13 percent in 1970 to nearly 36 percent in 2005, compensating for the declining share of the primary sectors (agriculture, forestry, livestock, and fisheries).

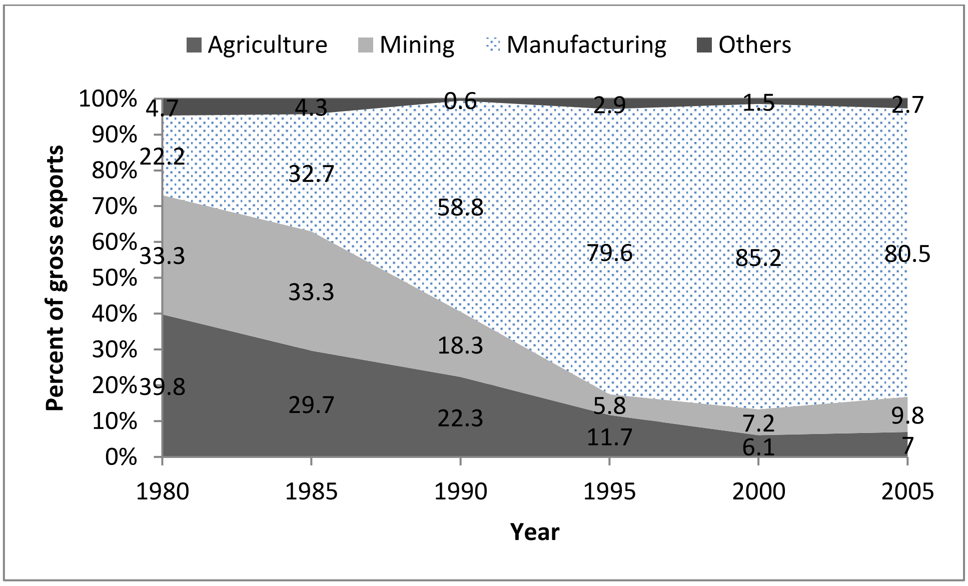
Table 3-2 Share of GDP (%) by sector, 1970 – 2005

Sector	1970	1975	1980	1985	1990	1995	2000	2005
Agriculture, forestry, livestock & Fisheries	30.8	27.7	22.2	20.3	18.1	13.6	8.7	7.0
Mining & quarrying	6.3	4.6	4.6	10.1	9.2	7.3	6.6	5.5
Manufacturing	13.4	16.4	20.5	19.1	26.9	32.4	33.4	35.8
Construction	3.9	3.8	4.5	5.1	3.5	3.6	3.3	3.2
Electricity, gas & water	1.9	2.1	2.3	1.7	1.9	2.1	3.4	3.4
Transport, storage and communication	4.7	6.2	6.5	6.4	6.9	7.3	8.0	8.6
Wholesale & retailers, hotel and restaurants	13.3	12.8	12.6	12.7	11.0	11.8	14.9	15.0
Finance, insurance, real estate & business service	8.4	8.5	8.2	8.8	9.7	10.6	11.8	12.4
Government services	11.1	12.7	13.0	12.3	10.6	9.7	7.0	5.7
Other services	6.2	5.7	5.6	3.5	2.2	1.6	2.9	3.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: *Malaysia Plan (years), EPU.*

The manufacturing sector is clearly the main contributor, having been the largest component of total exports; besides, Malaysia is also the world's 17th largest exporter (EPU, 2000). In tandem with its economic industrialization, the composition of Malaysia's exports had gradually shifted from comprising mainly of agricultural and mining products to manufactured goods. As shown in Figure 3.2, the development and growth in the manufacturing sector were quite rapid. Of the country's total exports, the sector accounted for well over 80 percent in 2000 and even after. By contrast, the share of exports by the agriculture and mining sectors, which were previously dominant, shows a drastic decline from 40 and 33 percent in 1980 to 7 and 10 percent respectively in 2005. Malaysia's export structure has focussed mainly on electrical and electronics (E&E) products, and on primary commodities such as petroleum and palm oil. In 2005, more than 40 percent of Malaysia's exports were accounted for by E&E, followed by natural resources (petroleum and chemicals) at roughly 24 percent (EPU, 2006).

Figure 3.2 Share of gross exports (%) by sector, 1980 – 2005



Source: *Malaysia Plan (various years), EPU.*

Corresponding to the economic diversification and major shifts in the sectoral contributions to its GDP, Malaysia's employment structure has changed markedly since 1970 (Kuruvilla and Erickson, 1998; Inagami, 1998). The manufacturing sector was not only driving force behind the country's GDP and exports growth but was also the main provider of job opportunities, replacing the agriculture sector (Lim, 1987). In 2005, the manufacturing sector generated 566,300 new jobs, accounting for almost 30 percent off all new jobs created in the country (Malaysia, 1991). Table 3.3 shows the employment share (%) by sector over the period 1980–2005. By 2005, the employment share of agriculture, which had been dominant in 1980, was lower than that of manufacturing. The agriculture sector had contracted considerably, from contributing about 41 percent of total employment in 1980 to merely 12 percent in 2005. In contrast, during the same period, employment in the manufacturing sector increased significantly from about 16 percent in 1980 to almost 30 percent in 2005.

Table 3-3 Share of employment (%) by sector, 1980 - 2005

Sector	**1980**	**1985**	**1990**	**1995**	**2000**	**2005**
Agriculture, forestry, livestock & Fisheries	40.6	35.9	26.0	18.0	15.2	12.0
Mining & quarrying	1.7	1.5	0.6	0.5	0.4	0.4
Manufacturing	15.8	18.0	19.9	26.0	27.6	29.5
Construction	5.2	5.5	6.3	8.3	8.1	8.1
Electricity, gas & water	1.0	1.0	0.7	0.9	0.8	0.1
Transport, storage and communication	3.8	3.8	4.5	5.0	5.0	5.8
Wholesale & retailers, hotel and restaurants	12.7	13.7	18.2	16.8	17.1	17.3
Finance, insurance, real estate & business service	1.0	1.1	3.9	4.8	5.5	6.0
Government services	13.9	14.9	12.7	11.0	10.6	9.8
Other services	4.3	4.6	7.2	8.7	9.7	11.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: *Malaysia Plan (various years), EPU.*

Malaysia was listed as the world's 15th most attractive foreign direct investment (FDI) destination in the *2014 FDI Confidence Index Report* by the global management consultant A.T. Kearney, and a majority of those FDI entered in Malaysia was in the manufacturing sector. In 2011, the manufacturing sector accounted for just over half of the total FDI inflows or about RM16.85 billion out of RM33.7 billion (DOSM, 2012). In addition, Malaysia is considered the world's top manufacturing location, followed by Taiwan, South Korea, Thailand, and China who are placed second, third, fourth and fifth, respectively (Cushman & Wakefield).

Apart from the above, the manufacturing sector also has the capacity to: (1) encourage the expansion of the agriculture-based sector via its downstream activities such as product processing, packaging and distributing; (2) support the utilization and development of R&D and ICT adoption for business and manufacturing purposes; and (3) offer and provide the working experience, industrial training and actual case study for education and other government sectors in order to enhance the Malaysian education sector (Chang, 2012). In short, the manufacturing sector plays a vital role in the transformation and development of the Malaysian economy.

3.4 Remuneration system and pay trend in Malaysia

In most countries, the wage formation system is based on collective bargaining between the employer and worker representatives. In Malaysia, collective bargaining is a formal process which is determined by two important legislations, i.e. the Trade Union Act of 1959 and the Industrial Relations Act of 1967. Employers and workers are free to establish unions subject to the provisions of the Trade Union Act. The Trade Union Act provides for trade unions to be formed on the basis of a particular industry, occupation, trade, and establishment (or similar trades, occupations, industries or establishments). Only the trade unions of employers and trade unions of workers have the right to represent employers and workers on issues concerning industrial relations, which include collective bargaining.

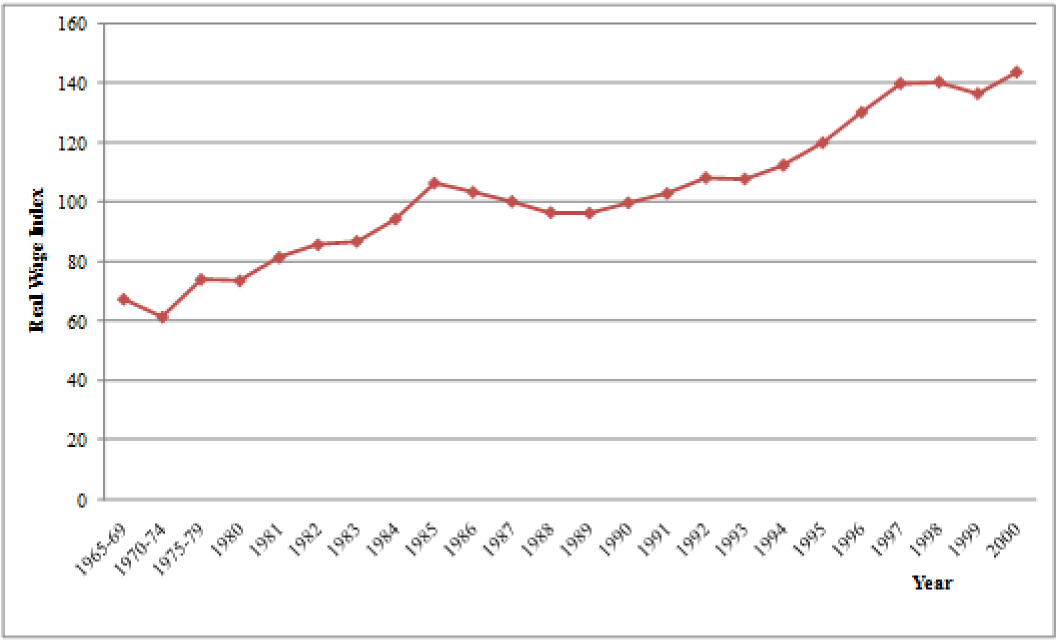
In Malaysia, wage formation is based on its private sector remuneration systems that have evolved according to peculiarities of the industry and labour market conditions. In this sector, the wage structure may be in the form of salary scale, salary range, minimum and maximum annual increment, or collective bargaining. The previous remuneration system, which was fixed and not based on productivity, weakens firms' performance in terms of facing fluctuation in demand for output (Abdul-Ghani et al., 2001). This variation in demand translates into fluctuation in employment (Abdul-Ghani et al., 2001). This was evident during the slow economic performance in the mid-1980s and the economic crisis of 1997-1999, wherein employers laid off some of their workers in order to reduce costs in response to slow demand in output (Abdul-Ghani et al., 2001).

The NLAC of Malaysia has recognized some weaknesses of the fixed remuneration system. These are: (1) the general trend of wage increase is rapid and not related to productivity improvement; (2) annual increments are pre-determined and are given automatically to all workers regardless of the level of performance; (3) remuneration is not related to company performance; (4) collective agreements are usually fixed for three years and are binding on both parties; (5) terms in the collective agreement cannot be reduced even when a new agreement is concluded.

Consequently, on 1 August 1996, the Malaysian government introduced the Productivity-Linked Wage System (PLWS) which establishes a closer link between wages and productivity. Based on the Third Industrial Master Plan, the objectives of the PLWS are to: (1) establish a closer link between wages and productivity so as to enhance competitiveness and promote employment stability; (2) enable employers to develop a broader and systematic approach towards improved productivity and wages through the active involvement and cooperation of their employees; (3) enable employees to obtain a fair share of the gains that arise from productivity growth and performance improvement, thereby promoting equity, social cohesion and enhancing the quality of life as well as developing improved skill-related career paths and increasing job satisfaction. In short, by linking wages to productivity, it makes the following possible to achieve: (1) higher wages for worker and higher profits for employers; and (2) greater competitiveness for employers.

Wage formation is a key element in economic growth and economic transformation. The real wage growth in the Malaysian manufacturing sector was very much in line with the growth of its GDP and development of its labour market. It was also influenced by changes in the trade and economic policies of its government. These statements can be explained by looking at the trend in wage growth for the manufacturing industry as a whole as well as for sub-sectors of the manufacturing industry over the years. Wages in the Malaysian manufacturing sector have witnessed changing patterns in recent times. As indicated in Figure 3.3, in the early 1970s, the real wage rate index (1990 = base year) in the manufacturing sector decreased from 68 (during 1965-1969) to 60 (during 1970-1974).

Figure 3.3 Real Wage Rate Index (1990=100) in Malaysian Manufacturing Sector, 1965-2000



Source: *Athukorala, 2001.*

Athukorala claimed that "the observed decline in real wages was largely a reflection of the shift in the structure of production away from (capital-intensive) import substitution activities and towards (labour-intensive) export production. At the same time, growth of real wages was also naturally constrained by the excess supply of labour in the economy, particularly from rural areas" (Athukorala, 2001: p. 18). Rasiah noted that "massive labour-intensive, FDI-dominated expansion in the early 1970s did not raise wages because of the low value added nature of production operations and high labour reserves due to high unemployment rates" (Rasiah, 2002: p. 38).

However, the index of real wages started to increase in late 1979 to 74.2, and kept on rising to 106.6 in 1985. The rise in wages during this period was due to the government policy at the time, which put more emphasis on an export-led industry and less on import substitution (Athukorala, 2001). Besides, the retrenchment of low-wage workers as well as deflationary conditions in the mid-1980s led to increase in wages

(Rasiah, 2002). Hence, the higher wage growth prompted the unemployment rate to increase by about 8 percent in the mid-1980s and consequently restricted wage growth between 1986 and 1989 (EPU, 1986).

The growth rate in wages increased dramatically between 1987 and 1997 in line with Malaysia's economic boom during the same period, before falling off due to the financial crisis that later affected the Malaysian economy in 1999, although it regained pre-crisis level in 2000 (Athukorala, 2001). Moreover, the tightening of labour market also pushed wages up during this period (Rasiah, 2002; EPU, 2006). The general perception has been that after the Malaysian economic boom in the ten-year period starting from 1987, the labour market has since tightened in recent years. This perception is based on a significant increase in real wages and a decline in the rate of unemployment. However, Athukorala (2001) revealed three key performance characteristics of the Malaysian labour market during these periods which run opposite to this general perception. Firstly, despite the notable upward trend in real wages since the late 1980s, the rate of growth in real manufacturing wages has constantly lagged behind that of employment growth. For example, from 1987 to 2000, real wages grew by only 3.4 percent, whereas employment grew by 9.7 percent.

Secondly, the growth in real wages has been significantly slower than that of labour productivity, and the gap between the two has widened in recent years. Therefore, wage share in value added and the price cost margin, which remained practically flat until the mid-1990s, has since steadily increased. Thirdly, real wage growth in Malaysia during the 1990s was much slower than that in Korea, Taiwan, Hong Kong and Singapore during the same period and even a decade earlier (Little, 1999). These three features of labour market performance suggest that growth in employment and wage rate in Malaysia was consistent with a situation in which the labour demand curve shifts along an elastic labour supply curve.

Athukorala (2001) drew a comparison between real wage indices of export-oriented and domestic-oriented manufacturing production. The findings of the comparison showed that wage growth in export-oriented manufacturing has begun to persistently surpass that in domestic-oriented manufacturing from the early 1990s. From 1990 to 2000, the compound annual growth in real wage in export-oriented sectors was 6.5 percent, and in domestic-oriented sectors it was 4.4 percent. This evidence is consistent with other ones, e.g. Were and Mugerwa (2009) who show that exporting firms are more efficient and have higher productivity, and so can pay higher wages. The present study tries to include this variable in examining the Malaysian pay structure at the firm-level.

Real wages in sub-sectors of the manufacturing industries have also dropped dramatically over the last ten years since the Asian financial crisis (Hunt, 2009). As stated in the 'Reshaping Economic Geography Report in East Asia' and the Pacific region, the decline in real wages was in tandem with a decrease in GDP over the last ten years. Table 3.3 illustrates that growth in real wages had decreased significantly to 1.9 percent post-crisis (1998-2007) from 5.6 percent pre-crisis (1994-1997) per annum for export-oriented industries. Meanwhile, real wage growth rates had fallen to 1.4 percent post-crisis from 6.8 percent pre-crisis per annum for domestic industries.

Table 3-4 The Malaysian Manufacturing Real Wage Changes

Trade Policy	Industry	Real wages growth per annum (%) Pre-crisis (1994-1997)	Post-crisis (1998-2007)
EOI	*Average increase for EOI*	*5.6*	*1.9*
	Electrical and electronics	6.2	2.5
	Petroleum, chemical, rubber, plastic products and real estate	6.0	1.5
	Textiles, wearing apparel and leather products		
	Wood products, furniture, paper products, printing and publishing	5.8	-1.3
		2.8	1.4
ISI	*Average increase for ISI*	*6.8*	*1.4*
	Transport equipment and other manufactures		
	Food, beverages and tobacco	7.9	2.5
	Non-metallic mineral products, basic metal and fabricated metal	6.8	1.2
		5.9	0.6
	Total manufacturing	**5.9**	**1.8**

Source: *Reshaping Economic Geography Report in East Asia*

3.5 Malaysian labour market and challenges

The NEAC has identified seven critical factors that contribute to the sluggish Malaysian economic growth, namely: (1) absence of private investment; (2) difficulties of doing business; (3) low value added industries; (4) low-skilled jobs and low wages; (5) stagnating productivity growth; (6) insufficient innovation and creativity; and (7) lack of appropriately skilled human capital. These factors have become important issues and challenges that need to be addressed if Malaysia is to achieve its Vision 2020, i.e. transforming the nation into a developed and high-income economy by 2020. As a result, the Malaysian government has introduced a new development strategy under the Tenth Malaysian Plan 2011-2015 and the New Economic Model in order to move the nation forward to the next stage of development; in other words, to free itself from the so-called middle-income trap.

Over the last year, there has been much discussion on the notion that Malaysia has for long been caught in the middle-income trap. The middle-income trap dilemma can be explained by ASEAN's notion of "Glass Ceiling" (Ohno, 2009). There are four steps that East Asia's competing economies must implement in order to catch up with the forerunners (see Figure 3.6 for details). Industrialization of developing countries starts with the arrival of FDI companies in substantial number. In Stage 1, nearly all inputs are imported from abroad, while value-creating processes such as management, R&D, production of raw materials and key components, logistics, and marketing are mainly performed by foreigners. This situation reflects the fact that simple production, such as contract manufacturing of garment and footwear, food processing, and manual assembly of electronics parts, is set up for the most part under foreign dominance.

In Stage 2, the domestic supporting industries[27] start to develop due to mass contract manufacturing and machinery assembly. Most parts and components, except for the most difficult, are produced by either the FDI or local suppliers in the country over time. However, production is still highly dependent on foreign management and technology. Competitive firms and factories continue to be directed by foreign managers. Foreign dependency is significantly reduced in Stage 3. Management and technology capabilities are internalized, while localization extends from physical inputs to human resources. The country becomes an exporter of high-quality manufactured products and strongly invests in building production bases abroad. Finally, in Stage 4, the capacity to create new products and thereby to lead global industrial markets is achieved through innovation.

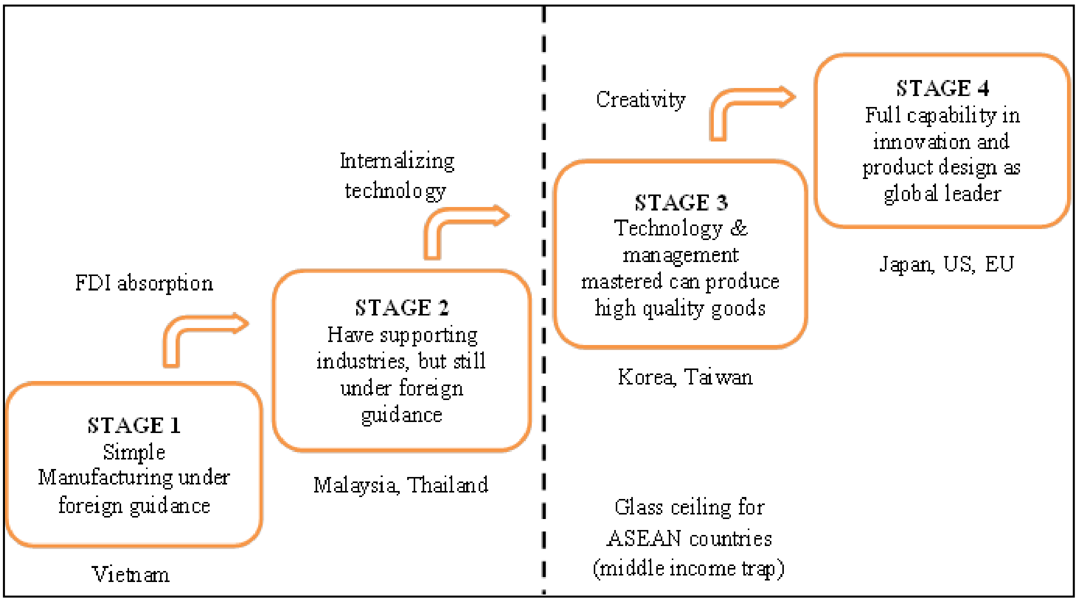
[27] The term 'supporting industries' refers to a layer of production establishments that supply parts and components to assembly-type manufacturing industries.

From a low-income country in 1957, Malaysia efficiently climbed the ladder to attain an upper middle income status by 1992. This is due to the successful shift from dependence on the primary sector to diversified manufacturing in the 1970s (Ohno, 2009). Rapid economic growth was also generated by the exports of manufactured goods, a proactive government, high savings rate, and strong direct foreign investment which supported the building of one of the best developed infrastructures in the region. But since becoming an upper middle income economy, like many others, Malaysia has largely stuck there[28].

Malaysia's industrial capability now looks less impressive. It started industrialization in the 1960s to diversify its economic infrastructure into manufacturing by the use of import-substitution and export-orientation strategy. The long-term macroeconomic records have been good despite shocks such as the recession in the early 1980s and the financial crisis of 1997-1998. But again, Malaysia has failed to move away from a heavy-reliance on foreign management and technology in manufacturing (Ohno, 2009). For example, the Malaysian electronics industry has grown remarkably in terms of volume and high-tech materials. However, key components and important processes such as design and marketing are still being supplied by FDI firms or through imports. As a result, locals only assemble or produce the "easy" parts while most values continue to be created and captured by foreigners. After five decades of Malaysian industrialization, the lack of discipline and skills among workers and the shortages of top and middle management remain key issues for the Malaysian labour market (Ohno, 2009).

[28] Based on 2008 data, the World Bank has classified upper middle income countries as those with a Gross National Income (GNI) per capita in the range of USD3,856 to USD11,905.

Figure 3.4 : Breaking the "Glass Ceiling" in Manufacturing



Source: *Ohno, 2009*

Why has Malaysia been caught up in this dilemma? It is caused by several factors such as price controls and drag from the agricultural sector (Onn, 2010). The price control policy was first enforced by the colonial government in 1941 in response to the economic hardships after World War 2, and it has since been enforced up until this day. Price controls have resulted in lower prices for commodities such as rice, flour, sugar, fertilisers, milk, chicken and even bus and taxi fares compared to outside markets. Since basic necessities constitute a large component of the Malaysian CPI, the cumulative effect of price controls for over sixty years has been a gross suppression of Malaysian CPI compared to the global CPI (Onn, 2010).

Increases in workers' annual pay are linked to the country's CPI (Onn, 2010). The divergence between suppressed Malaysian CPI and that of the rest of the world has also led to a corresponding significant divergence of the Malaysian wage rates in relation to the rest of the world. This is the major reason why ever since the 1980s, Malaysian wages have fallen behind wages in the rest of the world. For example, a graduate teacher starts at RM2,500 per month in Malaysia, compared to RM6,196 in Singapore, RM 11,864 in the UK, and RM15,681 in Hong Kong (Onn, 2010).

Besides restraining Malaysian wages, price controls also severely distort the domestic economic factor proportions, resulting in many firms using non-efficient economic production processes. With diesel and fuel prices being controlled, and workers' wages suppressed, manufacturers opt to use more fuels and labour as inputs instead of more machines, resulting in low-quality Malaysian products and, of course, low productivity growths (Onn, 2010).

In Malaysia, high-wage jobs have not been created in sufficient numbers. Malaysia's share of skilled labour has declined in 2007, when compared to 2002, across industries (MOF, 2010). This reflects the dominance in Malaysia of low value added goods, which only require low-skilled labour. According to the experience in more developed economies, the proliferation of skilled workers occurs when workers compete to upgrade themselves in search of higher wages and when firms see an increased use of skilled workers as necessary for raising their profitability.

The two factors are largely absent in Malaysia because in many instances, employers do not pay for skills, relying instead on tried and tested means such as a readily available pool of unskilled foreign workers and under-priced resources to generate profits. Malaysian immigration policies favour low-skilled and cheap labour. Between 1990 and 2005, foreign workers contributed more than a third of the increase in labour supply, of whom over 98 percent were low-skilled contract migrant workers. This situation has led to over-reliance on low-cost and unskilled foreign labour, which has sustained the profitability of low-value added business in the short term but which provided no incentive to move up on the value chain. It has also largely contributed to a dampening effect on wages. As a result of these trends, only 25 percent of Malaysia's labour force are highly skilled workers, compared to a significantly higher proportion in Singapore, Taiwan, and South Korea.

3.6 Conclusion

This chapter has shown that the Malaysian economy and its labour market have evolved over the last 30 years, due in part to the growing importance of its manufacturing sector. The manufacturing sector is the main contributor and driving engine that contributes significantly to the growth in the country's GDP, exports, and employment. The growth in manufacturing real wages is influenced by Malaysia's economic growth and its labour market conditions. Factors such as market forces and labour productivity have had an impact on changes regarding wages in Malaysia. When there were labour shortages in certain labour markets that were competing for the same workforce, wages increased at a faster rate compared to when there was a surplus of labour and relatively high unemployment. Meanwhile, increases in labour productivity have generally led to increases in wages demanded by labour groups. However, there are certain issues that restrain Malaysian wage growth such as price controls, lack of high-wage jobs and skilled labour, and a pool of unskilled and cheap foreign labour. The next chapter will explore three datasets used in this thesis in order to investigate wage determination in the Malaysian economy at the micro-level.

CHAPTER 4 : DATASETS AND SAMPLE CHARACTERISTICS

4.1 Introduction

Studies on pay and the Malaysian labour market have focused almost exclusively on factors that determine and shape the country's current and future supply of labour. For the most part, this has been driven by the availability of national datasets albeit limited essentially to industry and household surveys produced by the Department of Statistics Malaysia (DOSM). For example, data from the Annual Manufacturing Survey (AMS) as well as the Malaysian Family Life Surveys (MFLS) have led to a rich flow of useful and interesting results on the determination of earning in the Malaysian labour market.

However, a more integrated labour market model would, of course, also need to examine the contribution of inter-firm in shaping the domestic labour market. Since the recent release of Malaysia's Productivity Climate Survey (PICS), it has been possible to undertake such an endeavour. The main purpose of the survey was to identify the key constraints to competitiveness as perceived by firms in the manufacturing and selected business support services sectors in Malaysia (World Bank, 2005). We make use of datasets from this survey to examine the pay determinants in the Malaysian economy at the worker-level, firm-level, and matched worker-firm-level datasets.

For that reason, the aim of this chapter is to provide an overview of the datasets used in the empirical analysis in later chapters. As outlined in Chapter 1, the thesis focuses on three different perspectives in order to examine a number of questions surrounding pay determination in Malaysia. These three different analytical perspectives are the following: the first relies on employees' perspective alone, without taking into consideration the employers' perspective; the second depends on employers' perspective alone, without taking into account the employees' perspective; and the third takes into consideration both employers' and employees' perspectives.

In doing so, this thesis utilises three types of Malaysian datasets that are available from the second wave of Malaysia Productivity Investment Climate Survey (PICS-2) (2007/08)[29]. These datasets allow one to focus more closely on three different perspectives. The worker-level dataset (hereafter WLD) focuses on the impact of employees' characteristics alone; the firm-level dataset (hereafter FLD) focuses only on the impact of employers' characteristics; while the matched-worker-firm dataset (hereafter MWFD) focuses on the impact of both employees' and employers' characteristics on the determinants of pay and their related structure within the Malaysian economy.

The rest of this chapter is organized as follows. In Section 4.2, a general description of Malaysia's PICS-2 is given. In Section 4.3, we discuss sampling frames and the sample size. Next, in Section 4.4, we present the structure of the worker- and firm-level as well as matched worker-firm-level datasets for Malaysia. Besides, we outline the construction of the matching procedure and introduce the core variables of these

[29] The PICS-2 datasets were downloaded from the World Bank's Enterprise Surveys (ES) at www.enterprisesurveys.org.

datasets. Moreover, we present descriptive statistics of the main variables included in our datasets as well as provide some descriptive analyses. Finally, we draw some conclusions in the last section.

4.2 Malaysia's second productivity investment climate survey (PICS-2)

PICS-2 was jointly conducted between October 2007 and January 2008 by the DOSM and the EPU, in collaboration with the World Bank. The aim of this survey is to understand the climate in Malaysia and how it affects business performance. PICS-2 was obtained from the World Bank's Enterprise Surveys (ES) at http://www.enterprisesurveys.org. Note that the survey data presented on the website are primarily in the form of indicators, i.e. firm-level data has been aggregated to the country level. To access the complete datasets at the disaggregated firm- and worker-level, which include answers to all the survey questions, researchers must register with the Enterprise Analysis Unit[30].

The ES collect a wide array of qualitative and quantitative data from key manufacturing and services sectors in every region of the world. The ES topics include firm characteristics, gender participation, access to finance, annual sales, cost of inputs or labour, workforce composition, bribery, licencing, infrastructure, trade, crime, competition, capacity utilization, land and permits, taxation, informality, business-government relations, innovation and technology, and performance measures. The

[30] Users of this data are required to protect its confidentiality in accordance with World Bank rules governing "strictly confidential" information by completing the Enterprise Surveys Data Access Protocol.

mode of data collection is face-to-face interviews with firm owners, top managers and sampled workers regarding the business environment in their countries and the productivity of their firms. These surveys use two instruments, i.e. Manufacturing Questionnaire and Service Questionnaire.

Because the ES instrument (questionnaire) has evolved over time in terms of the questions asked and the way in which the questions are asked, and because different country characteristics have elicited country-specific questions, the data are offered in two formats:

1. Standardized survey – which country data are matched to a standard set of questions. This format allows for cross-country comparisons and analysis but sacrifices those country-specific survey questions which cannot be matched.
2. Country survey – offers complete survey information for a particular country's survey. In this format, the question coding is inconsistent across country surveys, even where the questions are identical, and is useful only for a single country or limited cross-country analysis.

In the case of Malaysia, firm-level surveys have been conducted twice. The first round survey (PICS-1 or PICS 2002) was conducted between December 2002 and May 2003, and ultimately 902 firms in the manufacturing sector and 249 firms in the services sector took part. The second round survey (PICS-2 or PICS 2007) was fielded between October 2007 and January 2008, involving 1,115 manufacturing firms and 303 firms in selected business service sectors. Four hundred and eighty-eight manufacturing firms and 137 services firms participated in both rounds of survey. PICS-1 was conducted using the standardized survey format, while PICS-2 used the country survey format. In addition, PICS-2 datasets are available at the firm- and worker-level, while with PICS-1 only data at the firm-level was published by the World Bank's Enterprise Survey. Therefore, the analyses in this thesis are grounded in datasets exclusively from PICS-2.

PICS-2 covers both firm- and worker-level datasets. These datasets are generated from separate employer and employee questionnaire modules. The employer module was carried out in a sub-sample of 1,115 firms covering six regions, different firm size categories, legal ownership status and sectors so as to accurately represent the population of firms. The sampling methodology of PICS 2007 includes first of all generating a representative sample of the whole economy that substantiates assertions about the manufacturing and business support services sectors; and secondly, generating large-enough sample sizes for selected industries to conduct statistically robust analyses.

4.3 Sampling frames and sample size for PICS-2

The sampling frame is taken from the Central Register of Establishments (SIDAP), managed by DOSM. The register is updated using information supplied by the Companies Commission of Malaysia (CCM), Employees Provident Fund (EPF), the 2006 Economic Census Data, and several regular surveys or censuses conducted by the DOSM. For the manufacturing sector, the economic activities are defined according to Divisions (2-digit codes) under the Malaysia Standard Industrial Classifications (MSIC) 2000, which are identical to the United Nations Statistical

Division's International Standard Industrial Classification of All Economic Activities (ISIC Rev. 3), up to 4-digit level. For the manufacturing sector, PICS-2 covered 10 manufacturing industries: food processing; textiles; garments; chemicals; rubber & plastics; machinery & equipment; electric appliances; electronics; auto parts; wood & furniture. Only firms with more than 10 employees are included.

For the business support service sector, PICS-2 covered 5 industries with two employment thresholds. Only firms with 10 employees are covered in the fields of information technology, telecommunications, and advertising & marketing; while only firms with more than 20 workers are covered for areas such as accounting & related professional services, and business logistics industries. Since very small firms would normally contribute insignificant information and that a substantial portion of the information required is not relevant to small firms, these are excluded from the survey.

In terms of geographical distribution, this survey covers six regions. Four regions are located in Peninsular Malaysia, and two in East Malaysia. Within each of the six regions, states and areas to be covered are selected based on the concentration of firms, as shown in Table 4.1.

Table 4-1 Geographical Coverage of Malaysia PICS-2

Region	State	Concentration Area
1. Central	Kuala Lumpur Selangor Melaka	Kuala Lumpur Kelang Petaling Melaka Tengah
2. North	Pulau Pinang Kedah	Pulau Pinang Kulim
3. South	Johor	Johor Bharu Batu Pahat Muar
4. East	Terengganu	Kuala Terengganu Kemaman
5. Sabah	Sabah	Kota Kinabalu
6. Sarawak	Sarawak	Kuching

Source: *Malaysia's PICS-2*

The total number of firms in the survey frame is 5,824, involving 3,322 firms from the manufacturing sector and 2,502 firms from the business support service sector. From the sampling frame, PICS-2 sampled 1,500 firms, of which 1,200 were manufacturing-based firms, while 300 were business support service-based firms. The total sample size for each sector is based on the time constraints of canvassing lengthy questionnaires within a short duration (World Bank, 2005). In drawing up the samples, a single-stage stratified systematic sampling is used. The sampling frame is stratified by sector, state, and industry. Within each sector, the total sample size is distributed to the substrata based on proportional allocation as follows:

$$n_{ijk} = N_{ijk} \times \frac{n}{N}$$

where

n_{ijk} = sample size for industry i, region j, and area k

N_{ijk} = total number of firms in industry i, region j, and area k

n = total sample size for the sector

N = total number of firms in the sector.

To select the sample for each sector, firms within each industry, region and area are arranged according to the output value. Selection is then carried out independently for each sub-stratum based on a linear systematic method (World Bank, 2005). The response rate to the PICS-2 survey for the manufacturing sector is quite high, at about 92.9%. A successful enumeration is 1,115 firms out of a total sample selection of 1,200 firms.

The response rate to the workers survey was as high as the first survey conducted in 2002, with 93.8% from manufacturing and 93% from business support services. The final result is a large representative matched employee-employer dataset that covers 13,140 workers across 1,418 workplaces in both the manufacturing and business support service sectors. In particular, PICS-2 consists of 10,350 workers across 1,115 workplaces in the manufacturing sector and 2,788 individuals across 303 firms in the business support service sector.

The focus here, however, is on respondents in full-time employment, aged between 15 and 64, who reported positive earnings, and in workplaces where more than four workers responded to the survey. This leaves about 10,302 employees across 1,043 manufacturing-based firms, and 2,772 workers across 303 business support service-based firms. Since business services is not representative of services in general, this thesis only utilises samples from the manufacturing sector, as these are representative of the manufacturing sector as a whole (World Bank, 2009).

4.4 The datasets

This section presents and discusses the datasets that will be used in the later chapters of this thesis. First, we discuss the Malaysian WLD that will be utilized in Chapter 5. Next, we discuss the Malaysian FLD that will be used in Chapter 6. Lastly, we discuss the Malaysian MWFD which will be applied in Chapter 7.

4.4.1 The Malaysian WLD

The Malaysian WLD was obtained from Malaysia's PICS-2, which in turn was generated from a survey of employees wherein a self-administered questionnaire was distributed to random samples of workers whose senior managers agreed to participate. About 10 workers in each firm were randomly selected, and the selected respondents had to complete four sections of the questionnaire. These sections are administrative records and ethnicity (Part A); education, skills, and life-long learning (Part B); employment dynamics (Part C); and information and technology (Part D).

In particular, PICS-2 involves10,350 employees in the manufacturing sector. The focus here, however, is on individuals in full-time employment, aged between 15 and 64, who reported positive earnings. It concerns 10,311 persons but due to the missing value in some variables, only 8,820 employees are included. In addition, workers with log of real monthly pay[31] that are more (less) than the 75th (25th) percentiles plus (minus) 3 times the interquartile range are considered extreme outliers and thus

[31] Monthly pay is deflated by the corresponding CPI obtained from the DOSM.

excluded from the analysis. This leaves us with 8,679 employees in the Malaysian WLD.

WLD comprises five categories of variables. The first category is basic human capital. It includes the number of schooling years (*edu*), highest level of education (i.e. university degree (*deg*), high school diploma (*dip*), upper secondary school (*ups*), lower secondary (*lws*), work experience and its squared (*exp, exp2*), and job tenure and its squared (*ten*, *ten2*). The second category is training and skills which include current training (*trn*), previous training (*trp*), computer skills (i.e. basic (*bcs*), moderate (*mcs*), and complex (*ccs*))[32], people skills (*pls*), vocational skills (*voc*), and studies abroad (*sab*). The third category is demographic which include gender (*fem*), marital status (*mar*), citizenship (*ctz*), races (i.e. Chinese (*chn*), Indian (*ind*), and others (*oth*))[33]. The fourth category is the kind of works (i.e. management (*mgt*), professional (*prf*), skilled production workers (*skl*), and non-production workers (*npd*))[34]. The final category is location (*loc*) and log distance from workplace (*ldis*). Table 4.2 includes definition of these variables and indicates how they are measured.

One of the disadvantages of this dataset is that it does not have data on the number and age of children. For that reason, this study is unable to consider those factors in determining the worker's pay, resulting in the omitted variable bias especially for women. This is because women tend to have more career interruptions and intermittent employment histories due to childbirth and childcare (Manzoni et al., 2008). Their

[32] Non-computer skill as a reference group.
[33] Malay as a reference group.
[34] Unskilled production workers as a reference group.

careers are more frequently interrupted for reasons of childcare, leading to less experience and depreciation of skills (Fouarge and Muffels, 2009). Still, the human capital theory (Becker 1985) predicts that, to the extent that mothers spend more time outside the labor market (for childbearing and childrearing), the labor market experience will explain much of the wage gap between mothers and other women. This prediction has been confirmed by several studies, which established that when employment experience is taken into account the unexplained difference in wages between mothers and other women narrows substantially. For example, Jacobsen and Levin (1995) found that controlling for employment experience (and related variables such as job tenure) eliminated much of the wage effects of children on women's pay. In addition, the presence and age of children are used as proxies for unavailable measures of several productivity-related factors. If the omitted productivity variables are correlated with gender, it is possible that the gender variable will serve in part as a proxy for those omitted variables. Usually, this issue is resolved by including job characteristics and fringe benefits as explanatory variables (Solberg and Laughlin, 1995). However, upon further research, it would be interesting to see how factors such as the number and age of children affect wages across different subsamples (i.e. male/female, Malay/other ethnicities) in Malaysia.

Table 4-2 The Malaysian WLD variables and definition

Variable Name	Definition	Data Type
Dependent variable		
lpay	Log of real monthly salary before tax, including all allowances and bonuses in 2006 in local currency (RM).	Continuous
Independent variables:		
	Basic human capital	
edu	*Education* Number of years of formal education completed	Continuous
deg	*College degree* Equal to 1 if the highest level of formal education attained is university and equal 0 otherwise.	Nominal
dip	*High school diploma* Equal to 1 if the highest level of formal education attained is high school, and equal to 0 otherwise.	
ups	*Upper secondary school* Equal to 1 if the highest level of formal education attained is upper secondary school, and equal to 0 otherwise.	
lws	*Lower secondary school* Equal to 1 if the highest level of formal education attained is lower secondary school or less, and equal to 0 otherwise. (Primary school or less as a reference group)	
exp	*Potential experience* Age – *edu* – 6.	Continuous
exp^2	*Potential experience squared*	
ten	*Tenure* Number of years worked in current firm	
ten^2	*Tenure squared*	
	Training and Skills	
trn	*Current training* Equal to 1 if the worker has received formal training from current employer, and equal to 0 otherwise (as a reference).	Nominal
trp	*Previous training* Equal to 1 if the worker has received formal training from previous employer, and equal to 0 otherwise (as a reference).	
bcs	*Basic computer skills* Equal to 1 if workers rated themselves as having basic computer skills such as being able to print invoices, and equal to 0 otherwise.	
mcs	*Moderate computer skills* Equal to 1 if workers rated themselves as having moderate computer skills such as being able to print invoices, and equal to 0 otherwise.	
ccs	*Complex computer skills* Equal to 1 if workers rated themselves as having complex computer skills such as being able to print invoices, and equal to 0 otherwise. (no computer skills as a reference group.)	
pls	*People skills* Equal to 1 if "4 (very important)" is the response to the question: "in your job, how important is dealing with people?" (possible answers range from 1-4), and equal to 0 otherwise (as a reference).	
voc	*Vocational skills* Equal to 1 if having completed a professional certification or skills training program such as attending a vocational school or if currently enrolled in an after work learning program, and equal to 0 otherwise (as a reference).	
sab	*Studied abroad*	

Variable Name	Definition	Data Type
	Equal to 1 if studied abroad, and equal to 0 otherwise (as a reference).	
	Demographic	
fem	*Female* Equal to 1 if the worker is female and equal to 0 if male (as a reference).	Nominal
mar	*Married* Equal to 1 if the worker is married and equal to 0 otherwise (as a reference).	
ctz	*Citizen* Equal to 1 if the worker has Malaysian citizenship, and equal to 0 otherwise (as a reference).	
chn	*Chinese* Equal to 1 if worker is Chinese and equal to 0 otherwise.	
ind	*Indian* Equal to 1 if worker is Indian (including Pakistani, Bangladeshi, and Sri Lankan) and equal to 0 otherwise.	
oth	*Others* Equal to 1 if worker is other than Chinese, Indian, and Malay. Equal to 0 otherwise. (Malay as a reference group)	
	Kind of works	
mgt	*Management* Equal to 1 if the worker's type of job is management, and equal to 0 otherwise.	Nominal
prf	*Professional* Equal to 1 if the worker's type of job is professional, and equal to 0 otherwise.	
skl	*Skilled production workers* Equal to 1 if the worker's type of job is skilled production worker, and equal to 0 otherwise.	
npd	*Non-production workers* Equal to 1 if the worker's type of job is non-production worker, and equal to 0 otherwise. (unskilled production worker as a reference group.)	
	Location and distance	
loc	*Location dummy* Equal to 1 if workers are from developed states such as Selangor, Kuala Lumpur, Melaka, Penang, and Johor, and equal to 0 if workers are from less developed states such as Kedah, Terengganu, Sabah, and Sarawak (as a reference).	Nominal
ldis	*Log of distance from workplace* Number of kilometres.	Continuous

Source: Author's definitions using Malaysia PICS-2.

Table 4.3 provides descriptive statistics for the variables in the WLD across gender. It is shown that female workers have longer years of schooling than the male ones but the latter have longer working experience and tenure. More than half of the employees attained a secondary level of education (65%), 40% of whom completed upper secondary school, while 25% only had lower secondary school. Those with tertiary level of education (namely, high school diploma and university/college degree) are higher among females compared to males. In contrast, the percentage of workers with only a primary level of education is higher among males than females.

With respect to training, about 41% and 20% of the workers have attended formal training from current and previous firm, respectively. Meanwhile, only 12% of the samples have obtained off-the-job training. The percentage of males who attended formal training from current employer is slightly lower than that for females. Still, the percentage of males with vocational skills is slightly higher than for females. In terms of skills, more than 60% of employees have computer skills which ranged from basic to complex skills. The percentage of those who have basic, moderate, and complex computer skills are 22%, 38%, and 6%, respectively. In addition, the percentage of male workers who do not have any computer skills was higher than it was for female workers. Moreover, only 30% of the employees have skills in dealing with people, and only about 5% have skills from having studied abroad. Those possessing these skills are higher among women than men.

In terms of demographics, the majority of workers are male, married, Malaysian, and Malay. With respect to the kind of work, most employees are skilled production workers, followed by unskilled production workers, non-production workers, management and professionals. However, the percentage of male workers in skilled production and unskilled production jobs is higher than that for female workers, whereas in management, professionals, and non-production positions, female workers are more dominant. In terms of location of residence, the majority of employees reside in the developed states (85%), with the highest percentage in Johor (33%), followed by Selangor (27%). For the less developed states, Kedah had the highest percentage of respondents (7.5%), followed by Sarawak (3%), with Terengganu having the lowest (2.2%).

Table 4-3: Mean and Standard deviations – Malaysian WLD

Variable	All		Male		Female	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Basic human capital						
Years of completed schooling	10.63	3.43	10.30	3.50	11.05	3.29
Level of education:						
University degree	0.08	0.27	0.07	0.26	0.09	0.29
High school diploma	0.12	0.33	0.10	0.30	0.16	0.36
Upper secondary school	0.40	0.49	0.38	0.49	0.42	0.49
Lower secondary school	0.25	0.43	0.29	0.45	0.21	0.41
Primary	0.14	0.35	0.16	0.37	0.13	0.33
Experience	16.31	10.74	17.15	10.59	15.27	10.83
Experience squared	381.36	450.91	406.18	456.14	350.48	442.44
Tenure	7.18	7.13	7.68	7.46	6.56	6.66
Tenure squared	102.45	191.72	114.61	209.08	87.33	166.44
Training and skills						
Training received in current firm	0.41	0.49	0.40	0.49	0.42	0.49
Training received in previous firm	0.20	0.40	0.20	0.40	0.20	0.40
Vocational skills	0.12	0.32	0.13	0.34	0.10	0.30
Complex computer skills	0.06	0.24	0.06	0.23	0.06	0.25
Moderate computer skills	0.38	0.49	0.31	0.46	0.48	0.50
Basic computer skills	0.22	0.41	0.24	0.43	0.19	0.40
No computer skills	0.34	0.47	0.40	0.49	0.26	0.44
People skills	0.30	0.46	0.29	0.45	0.31	0.46
Studied abroad	0.05	0.22	0.07	0.26	0.03	0.16
Demographics variables						
Female	0.45	0.50	0.00	0.00	1.00	0.00
Married	0.66	0.47	0.66	0.47	0.65	0.48
Citizen	0.91	0.29	0.85	0.35	0.97	0.16
Ethnicity:						
Malay	0.47	0.50	0.47	0.50	0.46	0.50
Chinese	0.35	0.48	0.30	0.46	0.41	0.49
Indian	0.09	0.29	0.08	0.28	0.10	0.30
Others	0.09	0.29	0.14	0.35	0.03	0.17
Distance from workplace (KM)	12.15	24.51	12.40	26.81	11.84	21.29
Log of distance	1.95	1.08	1.92	1.12	1.98	1.02
Kind of Works						
Management	0.14	0.35	0.11	0.31	0.18	0.38
Professionals	0.08	0.27	0.08	0.27	0.09	0.28
Skilled production worker	0.37	0.48	0.44	0.50	0.28	0.45
Unskilled production worker	0.24	0.43	0.26	0.44	0.22	0.41
Non-production worker	0.17	0.37	0.12	0.32	0.24	0.42
State of residence						
Developed states:						
Kuala Lumpur	0.06	0.24	0.07	0.25	0.06	0.24
Selangor	0.27	0.44	0.28	0.45	0.26	0.44
Melaka	0.37	0.19	0.03	0.18	0.04	0.20

Variable	All		Male		Female	
	Mean	SD	Mean	SD	Mean	SD
Johor	0.33	0.47	0.32	0.46	0.35	0.48
Penang	0.15	0.36	0.15	0.36	0.15	0.36
Less developed states:						
Kedah	0.07	0.26	0.07	0.26	0.08	0.26
Terengganu	0.02	0.14	0.03	0.17	0.01	0.11
Sabah	0.02	0.15	0.03	0.16	0.02	0.14
Sarawak	0.03	0.17	0.03	0.16	0.03	0.17

Note: See Table 4.2 for the definition of variables.

4.4.2 The Malaysian FLD

The Malaysian FLD was drawn from the employer module of Malaysia's PICS-2 on manufacturing firms. These firms are drawn from the register of companies in the Central Bureau of Statistics. This sub-section presents FLD and describes the variables used in analysing the average firm-level pay rate determinants in the Malaysian manufacturing sector at the firm-level (i.e. chapter 6). The employer module was carried out in a sub-sample of 1,115 firms covering six regions, different firm size categories, legal ownership status and sectors so as to accurately represent the firm population.

PICS-2 covers 1,115 manufacturing firms that are diverse in terms of types of products, geographical location, ownership structure, export orientation and firm size. Table 4.4 provides detailed distribution of manufacturing firms in Malaysian FLD. The majority of these firms are in rubber and plastic industry (25 percent), followed by food processing (22 percent), wood and furniture (12 percent), machinery and equipment (8 percent), garments (8 percent), electronics (8 percent), chemical (7 percent), and with the minority in textiles (4 percent), electrical appliances (3 percent), as well as auto parts (3 percent) industries.

Manufacturing firms are surveyed in nine states, as stated in Table 4.1. More than a third of the firms are from Selangor, Kuala Lumpur, and Melaka which is the central region of Malaysia, while 7 percent are from Sabah and Sarawak. In terms of ownership structure, 26 percent are foreign-funded management firms, of which more than 30 percent are owned by the foreign private sector. The share of foreign-funded management firms is highest in the electronics industry, and lowest in the wood and furniture industry – 68 percent of electronics producers are more than 30 percent foreign owned; while only 11 percent of wood and furniture producers are.

In terms of export-orientation[35], more than fifty percent (52 percent) of the firms are exporters, while another 48 percent are non-exporters. Electric appliances and electronics producers are most likely to export their products – approximately four-fifths of electronic firms are exporting firms. The majority of firms in chemicals, rubber and plastics, machinery and equipment, and wood and furniture industries are classified as exporters. Export-orientation is relatively low in the auto parts (26 percent) and food processing (39 percent) industries.

By firm size, the manufacturing firms surveyed are divided into three categories based on their total number of employment: first, a small firm is one whose total number of employment is less than 50 persons; second, a medium firm is one whose total number of employment is between 50 and 149 persons; third, a large firm has more than 150 workers. In PICS-2, the majority of firms are classified as small (45 percent), while 28

[35] Exporter refers to a firm that exports more than 10 percent of its total sales, while non-exporter refers to a firm whose sales from exports accounts for less than 10 percent of its total sales.

percent are classified as medium, and 27 percent are classified as large. Electronics and electric appliances firms are most likely to be large at about 66% and 50%, respectively.

Table 4-4: Distribution of Manufacturing Firms by Industry, Region, Export-orientation, Ownership, and Firm size in PICS-2 (%)

	Industries		*Percentage*
1.	Food processing		21.8
2.	Textiles		3.6
3.	Garments		8.1
4.	Chemicals		7.4
5.	Rubber and plastics		25.2
6.	Machinery and equipment		8.3
7.	Electric appliances		3.3
8.	Electronics		7.5
9.	Auto parts		3.1
10.	Wood and furniture		11.7
		Total	*100*
	Region		
1.	Central		35.6
2.	North		23.9
3.	South		31.0
4.	East Coast		2.6
5.	Sabah		2.8
6.	Sarawak		4.1
		Total	*100*
	Export orientation		
1.	Exporter		51.9
2.	Non-exporter		48.1
		Total	*100*
	Ownership		
1.	Domestically-owned		74.3
2.	Foreign-owned		25.7
		Total	*100*
	Firm size		
1.	Small (employment < 50)		45.1
2.	Medium (50<=employment<150)		28.3
3.	Large (employment >=150)		26.6
		Total	*100*

We have a cross-sectional dataset, short in time dimension with one year (i.e. 2006) of observations, but long in cross-section dimension with almost 1,115 manufacturing firms. After constructing our interest variables in the FLD, we screen the data to check if the data have been entered correctly, and then check for missing values, outliers and normality. FLD contains firm information of 38 interest variables we need to inspect, clean and treat before they can be used in our analysis. We concentrate on those variables that need to be constructed. Firms with missing values in any variables will be dropped from the sample. The percentages of observations lost in all datasets are around five to seven percent. Meanwhile, the percentages of observations in the complete case[36] is 6.75 percent (with 725 firms) according to the 2006 dataset.

These variables can be classified into two categories, i.e. interval and nominal variables. The first category consists of pay per worker (*avpay*), productivity per worker *(lval*), profit per worker (*pft*), percentage of skilled workers (*sskl*), capital-labour ratio (*clr*), percentage of foreign workers (*sfor*), percentage of higher education worker (*suniv*), percentage of female workers (*sfem*), value-added per worker (*val*), employer size (*lemp*), firm age (*fage*), and technology innovation (*tech*).

Meanwhile, the second category consists of dummies for large firm (*large*), medium firm *(medium*), exporter (e*xp*), foreign ownership (*fwn*), partnership (*ptn*), private limited company (*prlc*), public limited company (*pblc*), public corporation (*pbcn*), cooperative (*coop*), union (*uni*), double shift (*dshf*), triple shift (*tshf*), north (*nrt*), south (*sth*), east coast (*east*), Sabah (*sbh*), Sarawak (*swk*), garments (*grm*), chemical (*chm*), rubber and plastics (*rp*), machinery and equipment (*me*), electric appliances (*ea*), electronics (*elec*), automobile parts (*auto*), wood and furniture (*wf*), and textiles (*txl*). Table 4.5 provides definition of these variables and indicates how they are measured.

[36] 'Complete case' refers to the complete case on all variables in the dataset.

Table 4-5: Firm-level variables and definition

Variables	Definition
Average pay per worker *(avpay)*	The ratio of monthly manpower costs[37] (i.e.: wages and salaries plus allowances, bonuses and other benefits) to total employment[38].
Profit per worker *(pft)*	The ratio of operating revenue to total employment.
Percentage of skilled workers *(sskl)*	The share of skilled permanent workers (i.e. the sum of the number of management, professionals, skilled production and non-production permanent workers) in terms of total number of permanent workers (in percentage).
Percentage of higher education workers *(suniv)*	The share of labour with some university or higher level of education.
Percentage of female workers *(sfem)*	The percentage of total permanent female workers in terms of total employment
Capital-labour ratio *(clr)*	The ratio of net book value of machinery and equipment to total employment.
Percentage of foreign worker *(sfor)*	The share of foreign permanent workers in terms of total number of permanent workers (in percentage).
Productivity per worker *(val)*	The ratio of value added (defined as total sales minus intermediate costs[39]) to total employment.
Employer size *(lemp)*	Total number of permanent and temporal workers.
Firm age *(fage)*	Firm age is defined as a reference year minus the year wherein the firm started its operations.
Technology innovation *(tech)*	Percentage of machinery less than 5 years old.
Exporter *(exp)*	Defined as equal to 1 if the percentages given for sales exported directly and sales exported indirectly amount to more than 10 percent of total sales and equal 0 otherwise.
Foreign ownership *(fown)*	Defined as equal to 1 if the percentage of the firms owned by a foreign private sector is any positive number and equal 0 otherwise.
Partnership *(ptn)*	Defined as equal to 1 if the firm's legal status is partnership, and equal 0 if others.
Private limited company *(prlc)*	Defined as equal to 1 if the firm's legal status is a private limited company, and equal 0 if others.
Public limited company *(pblc)*	Defined as equal to 1 if the firm's legal status is a public limited company, and equal 0 if others.
Public corporations *(pbcn)*	Defined as equal to 1 if the firm's legal status is a public corporation, and equal 0 if others.
Cooperative *(coop)*	Defined as equal to 1 if the firm's legal status is cooperative, and equal 0 if others.
Double shifts *(dshf)*	Defined as equal to 1 if the type of work shift is double, and equal 0 if others.
Triple shifts	Defined as equal to 1 if the type of work shift is triple, and equal 0 if others.

[37] The total monthly manpower cost is defined as the total annual manpower costs divided by 12.
[38] Total employment is defined as the total number of permanent and temporal workers.
[39] An intermediate cost is defined as the sum of direct material costs, electricity expenditures, fuel and other energy expenditures.

Variables	Definition
(tshf)	
Union *(uni)*	Defined as equal to 1 if any of the firm's employees belong to a trade union and equal 0 otherwise.
north *(nrt)*	Defined as equal to 1 if region is north, and equal 0 if others.
south *(sth)*	Defined as equal to 1 if region is south, and equal 0 if others.
East coast *(east)*	Defined as equal to 1 if region is east coast, and equal 0 if others.
Sabah *(sbh)*	Defined as equal to 1 if region is Sabah, and equal 0 if others.
Sarawak *(swk)*	Defined as equal to 1 if region is Sarawak, and equal 0 if others.
Garments *(grm)*	Defined as equal to 1 if Industry is garments, and equal 0 if others.
Chemicals *(chm)*	Defined as equal to 1 if Industry is chemicals, and equal 0 if others.
Rubber and Plastics *(rp)*	Defined as equal to 1 if Industry is rubber and plastics, and equal 0 if others.
Machinery and equipment *(me)*	Defined as equal to 1 if Industry is machinery and equipment, and equal 0 if others.
Electric appliances *(ea)*	Defined as equal to 1 if Industry is electric appliances, and equal 0 if others.
Electronics *(elec)*	Defined as equal to 1 if Industry is electronics, and equal 0 if others.
Automobile parts *(auto)*	Defined as equal to 1 if Industry is automobile parts, and equal 0 if others.
Woods and furniture *(wf)*	Defined as equal to 1 if Industry is wood and furniture, and equal 0 if others.
Textiles *(txl)*	Defined as equal to 1 if Industry is textiles, and equal 0 if others.

***Note**:* Author's definition based on PICS- 2. Label of the variables in parentheses.

4.4.3 The Malaysian MWFD

Malaysia's MWFD, used in Chapter seven of this thesis, was constructed from Malaysia's WLD and FLD. Preparing the MWFD for analysis of the Malaysian pay structure involves four important steps. First, we review the names and labels of the selected variables at the worker- and firm-level data. Second, we verify that each variable is correct. This verification involves everything from assessing the internal consistency of information to looking for unreasonable distributions. The next step involves adding new variables and verifying that they have been created correctly. We apply these three steps to the WLD and FLD individually. Finally, we merge these datasets (i.e. WLD and FLD) in order to develop the Malaysian MWFD for analysis. By using this dataset, one would get a better understanding of workers' outcomes regarding pay. In this respect, pay can be informed not only by data on the employees themselves, as has always been the case, but also by the employers' own data.

Chapter seven utilises a unique MWFD for one common year (2006), which allows for a more in-depth analysis of worker- and firm-specific effects on wages. The dataset contains a random sample of 7,059 full-time permanent workers employed in 752 Malaysian manufacturing firms in the year 2006. It provides information on workers' monthly salaries and other characteristics of the workers and their firms.

4.4.3.1 Worker characteristics

The dependent variable in our analysis is the natural logarithm of monthly pay for employees in 2006. The monthly pay is defined as the sum of monthly salary, including all allowances and bonuses, before tax. The effect of education on wages was measured by two different variables. First, by a continuous measure of the years of completed schooling. Nevertheless, individuals' years of education seem to be biased estimates of education's true effects because some individuals do not earn degrees, while others do not complete their degrees within a standard number of years (Jagear and Page, 1996). Therefore, our dataset has information on both years of education and the highest level of formal education attained, allowing us to improve on earlier estimates. We use five dummies for the highest level of the worker's formal educational attained, namely, degree, diploma as a reference group, upper secondary, lower secondary, and primary plus informal education as well as illiterate – all as direct estimates of the effects of academic credentials on pay.

Due to the absence of data on experience, Mincer (1974) proposed the alternative of "potential experience", i.e. the number of years an individual could have worked after completing schooling. Assuming that he/she starts schooling at 6 years old and begins working immediately after having completed schooling, potential experience is equal to age – completed years of schooling – which is 6. In addition to education and experience, we also control for tenure, distance from job in kilometres, gender with male as reference group, marital status with single as reference group, types of occupation (i.e. management, professional, skilled-worker), unskilled worker as reference group, received formal training at the current employer, received formal training at the previous employer, computer skills (i.e. none as reference group, basic, moderate, and complex), studied abroad, and ethnicity (i.e. Bumiputera as reference group, Chinese, Indian, and others).

4.4.3.2 Employer characteristics

Firm performance is based on two variables: firm productivity (i.e. log of value-added per worker) and firm profitability (i.e. log of profit per worker). Firm input variables are logs of employment, capital, and capital-labour ratio, as well as share of skilled workers, female workers, foreign workers, and higher level of education workers in the firm. We also controlled for industry fixed-effects at the second stage of analysis with nine industry dummies. These are based on the 4-digit SITC for manufacturing firms, i.e. textiles, garments, chemicals, rubber and plastics, machinery and equipment, electrical appliances, electronic auto parts, wood and furniture, and food processing as a reference group.

4.5 Conclusion

This chapter discusses three types of dataset (the Malaysian WLD, the Malaysian FLD, and the Malaysian MWFD) as well as the constructing process of such dataset. These three dataset were obtained from PICS-2, and have been utilised throughout the empirical chapters of this thesis. We choose PICS-2 as the source of our datasets due to the availability and representativeness of the dataset. It is publicly accessible and administrated by non-Malaysian authorities. According to Ragayah (2008), the Malaysian survey data, e.g. Household Expenditure Survey, is difficult to acquire because it has often been classified by the Malaysian authorities as confidential. PICS-2 is administrated by the World Bank and is easily downloaded from the World Bank website once users are granted permission. PICS-2 seems broadly representative of the Malaysian firms in the manufacturing sector. Indeed, according to the World Bank (2009, p. 170): "The sampling methodology of PICS-2 generates a sample representative of the whole economy that substantiate assertions about the manufacturing sector and it also generates large enough sample sizes for selected industries to conduct statistically robust analyses".

In order to construct WLD and FLD datasets, we followed several procedures. Firstly, we generate our interest variables for the WLD (FLD) from separate employee (employer) questionnaire modules obtained from PICS-2. Secondly, we carried out data reconciliation in order to obtain a reliable dataset. Consequently, both WLD and FLD were merged to create the Malaysian MWFD.

Each of the datasets has its own advantages. The Malaysian WLD has the advantage that it provides extensive information on individual worker's characteristics. In addition, it also provides data on individual worker's total remuneration comprising total wages, over-time pay, bonuses, and other benefits. As suggested by Schafgan (2000), for other than the basic wages, remuneration is an important part of total earnings in Malaysia.

The advantage of the Malaysian FLD is that it contains a plethora of information that allows us to include employers' or firm's perspective in our study of average firm-level pay rates determinants in Malaysia. It also enables us to identify other labour market variables, especially firm's characteristics (i.e. firm size, ownership, export-orientation, unionization, firm age, technology, capital intensity, labour productivity, and profitability), which might help explain pay determinants in Malaysia. Most previous wage studies have detailed information only on workers. In addition, compared to other survey data for Malaysia, e.g. Household Income Survey, PICS-2 also enables us to investigate the elasticity of average pay with respect to the employer size due to the availability of data on firm size.

The advantage of the Malaysian MWFD is that it provides the opportunity to examine the role of employer-specific effects in determining the worker's pay through the availability of data from both the workers and their employers. Another advantage of all datasets is that this data includes the region of Sabah and Sarawak, which has been neglected in many previous studies due to a lack of data. Therefore, this study can provide a more wholesome picture for Malaysia compared to the many previous studies that only focused on Peninsular Malaysia. Besides, this thesis is among the first of its kind to utilize these data so as to explore the pay determinants in Malaysia. However, these datasets also have their limitation, as we were unable to carry out a dynamic analysis on pay determinants as it is a cross-sectional dataset.

CHAPTER 5 : THE ROLE OF WORKER CHARACTERISTICS ON INDIVIDUAL WORKER'S PAY IN THE MALAYSIAN ECONOMY

5.1 Introduction

As mentioned in Chapter 1, studies on pay formation and its structure in Malaysia are crucial, such that the issue has attracted many researchers. Nonetheless, in the case of Malaysia, studies on this issue have mainly focused on the macroeconomics perspective, and have thus been analysed at the national and industrial aggregation level, as discussed in greater detail in Chapter 2.

The aim of this chapter is to examine the determinants of the individual workers' pay in the Malaysian manufacturing sector. In particular, in this chapter we analysed how individual workers' pay is affected by employees' characteristics using the Malaysian WLD. Apart from using the new dataset obtained from PICS-2, this chapter also adds new variables to the Malaysian pay equation such as skills, on-the-job training, off-the job training, study abroad, and distance from work.

This chapter contributes to the existing literature on labour market outcomes in Malaysia by means of the richest workers' characteristics dataset. Apart from examining the impacts of basic human capital and demographic variables on the individual workers' pay, with such a new dataset, this chapter also intends to investigate whether: (i) addition of new variables (i.e. skills, training, studied abroad, occupation, location, and distance from the workplace) in the Malaysian pay equation better explains the variation in monthly workers' pay; (ii) these variables are important in determining the individual monthly workers' pay; (iii) workers who have skills, training, studied abroad, and live far away from their workplace earn higher monthly pay than similar workers who do not have skills, training, studied locally, and live close to their workplace.

Therefore, this chapter hopes to attain two goals: first, to explain the effects of employees' characteristics on individual workers' pay and to what extent pay variation can be explained by workers' characteristics alone; secondly, to ascertain whether employee characteristics' effects are heterogeneous across all quantiles as well as inter-quantile for all workers, male and female workers, respectively.

The rest of the chapter is organized as follows. Section 5.2 outlines the data used and presents some descriptive statistics, whilst Section 5.3 focuses on the empirical estimation methods. Section 5.4 outlines the empirical results of the supply-side pay determinants models of the Malaysian economy using OLS regression. In Section 5.5, the effects of workers' characteristics on individual worker's pay at different quantile pay distributions are explored using Quantile Regression analysis. Finally, Section 5.6 provides a summary and a few concluding remarks.

5.2 Data description

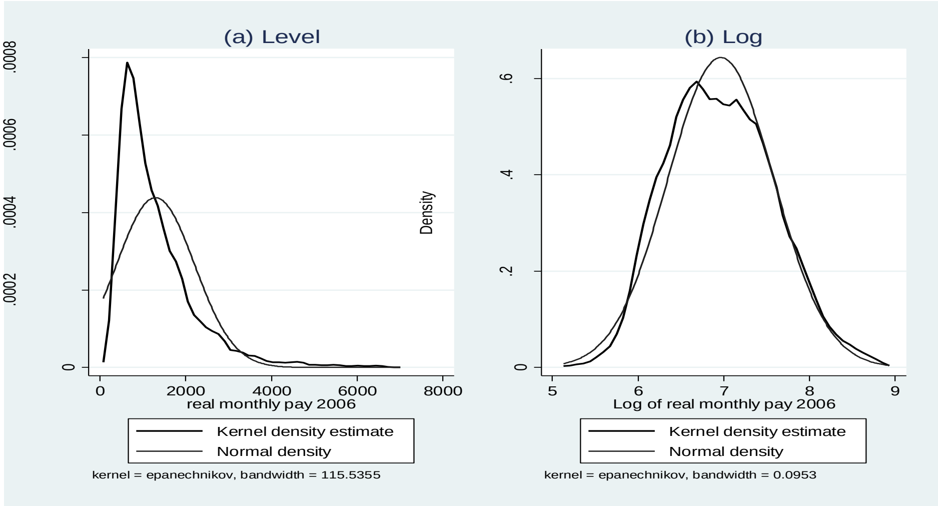
Malaysia's WLD, presented in Section 4.4.1, is used to examine the determinants of individual workers' pay in the Malaysian manufacturing sector. Since we use a dataset containing employees' information only, this chapter specifically examines how the individual workers' pay is affected by the labour supply-side factors (i.e. employees' characteristics such as education, and experience.) while holding the labour demand-side factors' effects constant (i.e. employers' characteristics). In the Malaysian WLD, the analysis is restricted to workers who have no missing values for the monthly pay and all explanatory variables. Such a restriction leaves us with 8,679 workers in the dataset.

5.2.1 Response variable for the Malaysian pay model

As defined in Section 2.2, the worker's monthly pay is the monthly salary including all allowances and bonuses measured in the local currency, i.e. Ringgit Malaysia (RM). The monthly pay varies across workers, with a standard deviation of RM 1753 (the equivalent of USD 521.69)[40]. The median of RM1079 is smaller than that of RM1472, reflecting skewness of data. The skewness is zero for symmetrically distributed data. The value here of 9.57 indicates considerable skewness. The much higher value of 144 for kurtosis indicates that the tails are much thicker than those of a normal distribution, where the reference value is 3 for normally distributed data. We conclude that the distribution of the monthly pay data is considerably skewed and has thick tails. A standard solution to eliminate these problems is to transform the dependent variable by taking the natural logarithm revealed in Figure 5.1.

[40] The conversion of Ringgit Malaysia (RM) to US Dollar (USD) was based on the exchange rate (selling rate) as of 11:30pm, 31 December 2007, as provided by Bank Negara Malaysia, i.e. 1 RM = 0.2976 USD.

Figure 5.1 The estimated density and log of monthly pay in 2006



The average worker in Malaysia's WLD earns just over RM1472 per month, has an average 7-year tenure with their employer, 11 years of schooling, 17 years of potential labour market experience, and 12.6 kilometres from their residence to their workplace[41].

5.2.2 Average worker's pay by categorical explanatory variables

Table 5.1 reports the mean monthly pay, classified by subgroups of each of categorical explanatory variables for all workers in pooled sample, and specifically by gender samples in the Malaysian WLD. Table 5.1 also provides the differences in pay according to gender. In general, the average monthly pay is RM 1,433, and women earn 84% of men's monthly pay (RM 1,300 against RM 1,539).

[41] We have discussed the summary statistics for each worker's characteristics in detail in Chapter 4.

Table 5-1: Mean and standard deviations of monthly pay for categorical variables in the Malaysian WLD in 2006

	Pooled		Male		Female		Mean differences (Male – Female)
	Mean	SD	Mean	SD	Mean	SD	
Level of education							
University degree	2,455	1239.9	2,763	1307.1	2,161	1095.9	602***
High school diploma	1,887	993.0	2,146	1123.1	1,683	822.7	463***
Upper secondary school	1,370	788.3	1,504	870.0	1,218	651.9	286***
Lower secondary school	1,221	745.0	1,319	791.6	1,050	627.0	269***
Primary	1,005	577.5	1,094	661.2	864	371.9	230***
Training							
Training in current firm – Yes	1,655	1008.7	1,792	1093.9	1,491	868.8	301***
Training in current firm – No	1,279	806.2	1,370	870.1	1,163	699.5	207***
Training from previous firm – Yes	1,710	1054.3	1,886	1144.4	1,496	887.5	390***
Training from previous firm – No	1,363	860.3	1,453	925.0	1,250	756.9	203***
Vocational skills – Yes	1,812	1011.0	1,905	1082.3	1,667	870.1	238***
Vocational skills – No	1,382	887.5	1,485	961.6	1,258	770.9	227***
Skills							
Complex computer skills	1,961	1083.7	2,177	1168.8	1,729	931.9	448***
Moderate computer skills	1,727	998.9	1,964	1124.4	1,538	842.8	426***
Basic computer skills	1,358	816.4	1,484	867.6	1,165	688.7	319***
No computer skills	1,052	633.4	1,155	701.7	857	412.5	298***
People skills – Yes	1,734	1043.6	1,885	1122.6	1,560	914.6	325***
People skills – No	1,306	820.5	1,401	892.2	1,184	699.5	217***
Place of institution							
Studied abroad	1,658	1339.9	1,584	1350.8	1,930	1269.4	-346**
Studied locally	1,420	882.5	1,536	953.3	1,284	768.8	252***
Marital status							
Single	1,205	708.9	1,217	743.5	1,190	665.0	27
Married	1,552	983.1	1,703	1054.8	1,359	845.8	344***
Citizenship							
Malaysian	1,495	925.4	1,663	1004.0	1,312	791.6	351***
Foreign	820	453.3	813	415.8	869	658.2	-56
Ethnicity							
Malay	1,307	804.9	1,443	867.6	1,132	678.1	311***
Chinese	1,777	1006.1	2,011	1102.1	1,565	858.0	446***
Indian	1,367	894.3	1,629	995.7	1,087	667.1	542***
Others	843	520.6	827	459.4	944	793.7	-117**
Kinds of Work							
Manager	2,147	1210.0	2,651	1286.9	1,778	1001.3	873***
Professionals	2,231	1034.3	2,429	1150.7	2,012	836.8	417***
Skilled production worker	1,375	774.9	1,491	800.2	1,146	666.1	345***
Unskilled production worker	947	515.0	1,007	585.0	857	371.1	150***
Non-production worker	1,290	667.9	1,322	703.5	1,271	644.9	51
State of residence							
Developed states:	1,464	910.6	1,575	983.2	1,328	792.7	247***
Kuala Lumpur	1,614	1040.6	1,694	1068.5	1,507	994.6	187**
Selangor	1,571	939.3	1,644	1016.2	1,476	818.7	168***
Melaka	1,494	950.9	1,741	1015.4	1,258	821.2	483***
Johor	1,323	815.6	1,435	877.2	1,195	718.7	240***
Penang	1,506	944.9	1,651	1050.3	1,320	749.2	331***
Less developed states:	1,256	909.9	1,347	922.8	1,127	761.9	220***
Kedah	1,322	891.5	1,374	901.3	1,259	876.8	115
Terengganu	1,110	979.5	1,230	1097.4	778	368.8	452***

	Pooled		Male		Female		Mean differences (Male – Female)
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Sabah	1,212	873.0	1,300	979.2	1,067	641.4	233*
Sarawak	1,228	920.5	1,443	1115.1	986	547.6	457***
Average	**1,433**	**913.5**	**1,539**	**988.1**	**1,300**	**791.5**	**239*** **
Number of observations	**8679**		**4811**		**3868**		

Notes: *, **, and *** denote 0.1, 0.05, and 0.01, respectively.

In the pooled sample, and in terms of educational attainment, pay increases linearly with education; the highest pay is reported for those with higher educational achievement. For example, university degree holders received a monthly pay of RM 2,455, compared with RM 1,887 for high school diploma holders, RM 1,370 for upper-secondary level qualification, RM 1,221 for lower-secondary level qualification, and RM 1,005 for primary level qualification.

With regard to training in current and previous firms, the average monthly pay is higher for those who have received such training compared with those who did not get any such training. For example, those who received training in their current firms earn 29% more than those who did not receive training in their current firms. Meanwhile, there are no significant differences in monthly earnings between those who have received training in current firms and in previous firms.

However, in terms of skills, the average monthly pay is higher for those who have any level of computer skills compared to those with no computer skills. In the case of people skills, there are no differences. In relation to place of institution, marital status and citizenship, the pay received by those who graduated abroad, are married and citizens is more than those who graduated locally, are single and foreigners.

With regard to ethnicity, the WLD reveals that the monthly pay is highest amongst Chinese, followed by Indians, Malays, and then other ethnics. For instance, the data shows that Malays earn about 73.6% of the earnings among Chinese (RM 1,777 against RM 1,307).

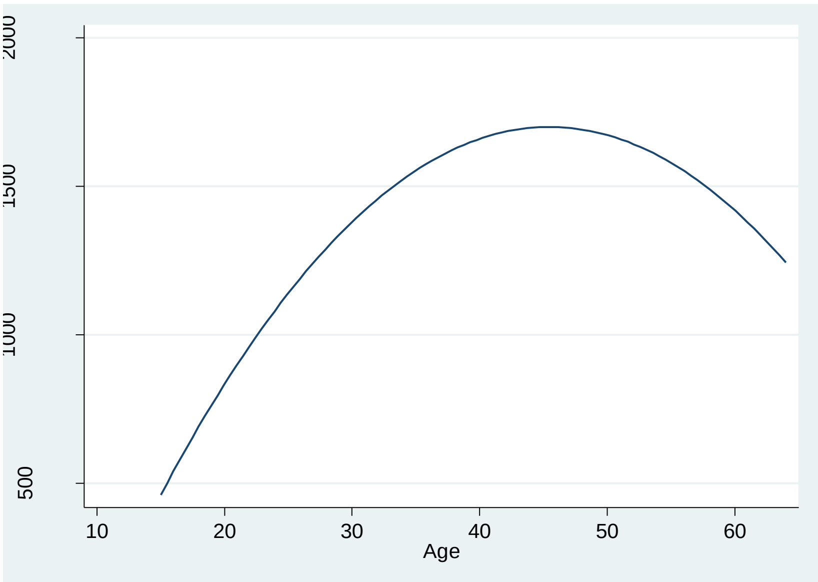
With respect to kinds of work, Table 5.1 indicates that the average monthly pay varies by occupation, with professional and management positions having the highest earning power, followed by skilled production jobs, non-production jobs, and then unskilled production jobs with the least pay. Based on that table, on average, professionals earned RM 2,231, while managers, skilled production workers, non-production workers, and unskilled production workers on average earned RM 2,147, RM 1,375, RM 1,290, and RM 947, respectively.

In relation to state of residence, Table 5.1 shows that those who live in the least developed states (i.e. Kedah, Terengganu, Sabah and Sarawak) earn less than those who live in the developed states (i.e. Kuala Lumpur, Selangor, Melaka, Johor and Penang). For example, people in Kuala Lumpur earn on average RM 1,614 per month relative to RM 1,322 per month for those who reside in Kedah.

With respect to the gender pay gap, Table 5.1 shows that the average monthly pay varies significantly between male and female workers. Male workers earn more than female ones in most of the subgroups of each of the explanatory variables except for those who studied abroad, are foreigners, and other ethnics. The highest gender pay gaps are among those who are working in management positions and have a university degree, where the male worker's average monthly pay is more than their female counterparts by RM 873 and RM 602, respectively.

Figure 5.2 shows the lifetime monthly pay profile of Malaysian manufacturing workers, constructed using the Malaysian WLD from Malaysia's PICS-2007. This profile is hump-shaped. It increases in the early stages of their working career, flattens out in their 40s, and eventually declines from about the age of 50 until retirement. The inverted-U shape of the wage profile means that the well-known hump in lifetime earnings – described by Mincer (1974), Welch (1979), and Heckman, Lochner and Todd (2006), among others – is not purely a reflection of declines in hours worked during the pre-retirement years.

Figure 5.2: Life-Cycle Earnings Profiles



Source: Author's calculation from the Malaysia's PICS-2

5.3 Empirical methods

As previously discussed in Chapter 2, the most common approach in estimating the determinants and structure of pay is based on Mincer's wage equation. And so, the empirical analysis in this chapter is based on the human capital theory developed by Becker (1964), while the estimation of the Malaysian pay equation uses an extended version of the human capital earning function proposed by Mincer (1974). Following this approach, the individual workers' pay reflects labour productivity which is determined by previous investment in human capital, i.e. it is assumed that an individual's stock of human capital is an important determinant of his or her pay rate. Therefore, in addition to these human capital factors, it is common practice nowadays to add several other worker characteristics that are believed to affect the worker's pay in the labour market. In order to estimate the Malaysian pay equation, we consider a reduced form of equation where the log monthly pay is a linear function of the workers' characteristics as follows:

$$ln\,Pay_i = \alpha_i + \beta X_i + \mu_i \qquad \textbf{5.1}$$

where the response variable $ln\,Pay_i$ is the natural logarithm of monthly pay (in Malaysian Ringgit (RM)) for employee *i*. X_i represents a vector of the worker's characteristics, while μ_i represents a random disturbance term, which is assumed to be an identically independent distribution (*iid*)$\left(0,\sigma_u^2\right)$. Pay is analysed by a variety of measurements such as annually, monthly, weekly, and hourly in the human capital pay equation literature depending on data availability, and it is always in the logarithmic form. Consistent with those literature, the dependent variable in equation (5.1) makes use of the log transformation based on the success of the standard (semi-logarithm) human capital earnings function (Willis, 1986). In addition, the logarithmic form is preferable due to the distribution of log pay being very close to a normal distribution, especially log hourly wages (Card, 1999). The method used here is preferable, given that the available data and log transformation are convenient for interpretation in this study. Therefore, this study uses the log of monthly pay as the dependent variable.

Meanwhile, explanatory variables X_i in equation 5.1 can be grouped into five categories, namely: (1) basic human capital, (2) demographic factors, (3) training and skills, (4) kinds of work, and (5) distance and location. We add these categories of variables gradually, which will be discussed in the next sub-section.

5.3.1 Model specification

In order to examine the impact of workers' characteristics or supply-side labour factors on the individual worker's pay in the Malaysian economy, we estimate equation 5.1 using Malaysia's WLD in three different specifications, as discussed in the following.

5.3.1.1 Basic pay model

Basic pay comprises three different models. Initially, we used the basic Mincerian specification of the linear model introduced by Mincer (1974). In this model, the natural logarithm of pay is a function of linear term in schooling as well as both linear and quadratic terms in labour market experience. Algebraically,

$$ln\,Pay_i = \alpha_{1i} + \beta_1 edu_i + \beta_2\, exp_i + \beta_3\, exp_i^2 + \mu_{1i} \qquad \textbf{5.2}$$

where,

$ln\,Pay_i$ is a log of monthly pay for worker *i*,

edu_i is year of completed schooling of worker *i*,

exp_i is year of potential experience of worker *i*,

exp_i^2 is year of potential experience squared of worker *i*, and

μ_{1i} is the disturbance term that is assumed to be *iid* $\left(0, \sigma_u^2\right)$.

In line with the human capital theory, the return on education is expected to be positive. As pointed out by Mincer (1958), education should have a multiplicative effect on human capital in a simple model, where identical individuals maximize the present value of their future income when equalized for all educational levels. The reason is that investments in human capital, as with other investments, are only undertaken as long as the rate of return (not the absolute return) on any investment exceeds the discount rate. Log-linearity of earnings, as a function of years of schooling, is in fact a key empirical of the human capital model with identical individuals according to Mincer (1958).

Direct information for the exp_i variable cannot be found in the dataset. To deal with it, this study uses the potential labour market experience proposed by Mincer (1974). In this respect, exp_i refers to the number of years an individual A could have worked after completing schooling. This assumes that he/she starts schooling at 6 years old and begins working immediately after having completed the years of schooling (exp_i = age – *edu* – 6). We would expect that exp_i has a positive sign. This is because the more experience workers have, the higher the salary they get. Apart from exp_i we also include exp^2 to our model in order to capture concavity in the observed pay profile.

The second step is to add job tenure and job tenure squared variables in order to capture the impact of job seniority on the individual worker's pay, as suggested by Mincer-Jovanovic (1981). This mode has been widely estimated using linear in education and quadratic in potential labour market experience as well as job tenure in the incumbent firm – which can be algebraically represented as:

$$ln\,Pay_i = \alpha_{1i} + \beta_1 edu_i + \beta_2\, exp_i + \beta_3\, exp_i^2 + \beta_4 ten_i + \beta_5 ten_i^{\;2} + \mu_{2i} \qquad \textbf{5.3}$$

where,

ten_i is year of work in current firm of worker *i*.

ten_i^2 is year of tenure squared of worker *i*,

μ_{2i} is the disturbance term that is assumed to be *iid* $\left(0,\sigma_u^2\right)$,

and the rest of the variables and parameter symbols have been defined above.

In this model, the effect of work experience on the worker's pay was measured by two variables, namely potential labour market experience and job tenure. In this study, we expect exp_i and ten_i to have a positive sign. This is because the more experience (or tenure) workers have, the higher the salary they get. Apart from exp_i and ten_i, we also include exp^2 and ten^2 in our model in order to capture concavity in the observed pay profile. Concavities occur whenever these two variables have negative signs.

In the third model, apart from the impact of the worker's education on pay that was measured by a continuous measure of the years of completed formal schooling, we include a series of dummies for the highest level of formal education attained by the worker (i.e. degree, diploma, upper secondary, lower secondary, and primary education as reference) as follows:

$$\begin{aligned} ln\,Pay_i &= \alpha_{1i} + \beta_1 edu_i + \beta_2\, deg_i + \beta_3 dip_i + \beta_4 ups_i + \beta_5 lws_i \\ &+ \beta_6\, exp_i + \beta_7\, exp_i^2 + \beta_8 ten_i + \beta_9 ten_i^2 + \mu_{3i} \end{aligned} \qquad \textbf{5.4}$$

where,

deg_i is a dummy variable for degree as the highest education level,

dip_i is a dummy variable for diploma as the highest education level,

ups_i is a dummy variable for upper-secondary school as the highest education level,

lws_i is a dummy variable for lower-secondary school as the highest education level,

μ_{3i} is the disturbance term that is assumed to be *iid* $\left(0,\sigma_u^2\right)$,

and the rest of the variables and parameter symbols have been defined above.

Based on this model, one can estimate the coefficient of β_1 as the average private rate of return on education, which is expected to have a positive sign. Nevertheless, the individual's years of completed schooling will be biased estimates of the true effects because some individuals do not earn certificate or degrees, while others do not complete their certificate or degrees within a standard number of years (Jagear and Page, 1996).

One of the advantages of Malaysia's WLD is that it allows for improving the estimation by adding the information on the worker's highest level of educational attainment. By including these dummies, it is expected to pick up the marginal effect of obtaining a certificate of completion for each type of educational level or one can directly estimate the effects of academic credentials on the worker's pay. We expect β_2, β_3, β_4, and β_5 to have a positive sign because workers that hold a degree, diploma, upper-secondary qualification, and lower-secondary qualification would earn more than those with only a primary school qualification.

These three basic pay models are a benchmark for our estimation of the individual worker's pay in Malaysia. Nonetheless, the disadvantages of this model are that it assumes all workers to be identical other than their differences in education and experience. In other words, the model assumes that each worker has equal ability, equal opportunities, and has been brought up in a similar environment. Owing to these advantages, we extend this model by gradually adding other worker characteristics. In what follows, we analyse the impact of those characteristics by means of two augmented models.

5.3.1.2 Augmented Mincerian pay model 1

It is common nowadays to add other potential determinants of pay to the Mincerian pay regression, in addition to the standard human capital factors. The difference due to demographic characteristics in the individual worker's pay is evident in many studies. Almost every study employing the Mincerian pay regression includes control for workers' demographic differences. Therefore, we extend our model by including dummies of gender, marital status, citizenship, and ethnicity, as follows:

$$\begin{aligned}\ln Pay_i &= \alpha + \beta_1 edu_i + \beta_2 \deg_i + \beta_3 dip_i + \beta_4 ups_i + \beta_5 lws_i + \beta_6 \exp_i \\ &+ \beta_7 \exp 2_i + \beta_8 ten_i + \beta_9 ten2_i + \beta_{10} fem_i + \beta_{11} mar_i + \beta_{12} ctz_i \\ &+ \beta_{13} chn_i + \beta_{14} ind_i + \beta_{15} oth_i + \mu_{3i}\end{aligned} \qquad \textbf{5.5}$$

where,

fem_i is a dummy variable for female,

mar_i is a dummy variable for married,

ctz_i is a dummy variable for Malaysian citizenship,

chn_i is a dummy variable for Chinese,

ind_i is a dummy variable for Indian,

oth_i is a dummy variable for other ethnics,

and the rest of the variables and parameter symbols have been defined above.

We know that workers are diverse in their demographic attributes, which have implications for their pay. We add a dummy of fem_i, as being female may have an influence on the decision whether or not to participate in the labour market. We would expect β_{10} to have a negative sign because some labour markets probably have less educated and highly skilled women. In addition, women may also work less than men due to their household responsibilities. Like gender, marital status also affects the individual worker's decision to participate in the labour market. We add a dummy of mar_i to separate married workers from those who are single, divorced or widowed. It would seem that β_{11} has a positive sign because marriage increases the need for household tasks.

Many previous studies on pay determinants (e.g. Toutkoushian et al., 2007; Joy, 2003) have included citizenship and ethnicity in their model in order to capture the labour market status of minority groups. In the case of Malaysia, differences between wages paid to Chinese and Malays were significantly higher, indicating a stronger ethnic disparity (Schafgan, 1998; 2000). In addition, Ismail and Mohd-Noor (2005) also found that Malay workers received lower wages than their Chinese counterparts. An indication that there can be substantial differences between Malaysians and foreigners is shown in Table 5.1, where citizens' pay is higher than that of foreigners. When observing differences across ethnicities, it can be seen from Table 5.1 that pay is highest amongst Chinese, followed by Indians, Malays, and then the other ethnic groups.

Therefore, to take into account workers' citizenship and ethnicity, we add a dummy of ctz_i to separate Malaysian workers from those who are foreigners, while dummies of chn_i, ind_i ,and oth_i are meant to separate Chinese, Indian, and other ethnics from those who are Malays, respectively. We expect that β_{12}, and β_{13} may have a positive impact, while β_{14} may has a negative impact on the individual worker's pay. For the estimation process, male, single, foreigners, and Malays will be taken as a reference category.

5.3.1.3 Augmented Mincerian pay model 2

Apart from explanatory variables in the Augmented Mincerian Model 1, other human capital (such as training and skills) factors are also important in determining the individual worker's pay. The human capital theory (Mincer, 1958, 1974; Becker, 1964) suggests that the relative contribution of individual workers depends on the knowledge, skills, and other attributes they have. Therefore, equation 5.5 can be extended by incorporating dummies of current training, previous training, computer skills, people skills, vocational skills, and study abroad. In addition, we also believe that the kinds of work and pay are not distributed strictly on the basis of worker qualifications. Therefore, we also include the dummies of kinds of work which comprises management, professionals, skilled production jobs, non-production jobs, and unskilled production jobs (as reference). In this model, we also include distance and location factors. The inclusion of these variables is important because these regional characteristics may also affect the probability of work activity. This may be due to differences in opportunities in different areas and different labour market conditions or it may be due to differences in the supply and demand for skilled and unskilled workers in different areas. To take into account all factors that have been discussed, we extend the augmented Mincerian pay model 1 as follows:

$$
\begin{aligned}
\ln Pay_i = {} & \alpha + \beta_1 edu_i + \beta_2 \deg_i + \beta_3 dip_i + \beta_4 ups_i + \beta_5 lws_i + \beta_6 \exp_i \\
& + \beta_7 \exp 2_i + \beta_8 ten_i + \beta_9 ten2_i + \beta_{10} fem_i + \beta_{11} mar_i + \beta_{12} ctz_i \\
& + \beta_{13} chn_i + \beta_{14} ind_i + \beta_{15} oth_i + \beta_{16} trn_i + \beta_{17} trp_i + \beta_{18} pls_i \\
& + \beta_{19} voc_i + \beta_{20} bcs_i + \beta_{21} mcs_i + \beta_{22} ccs_i + \beta_{23} sab_i + \beta_{24} mgt_i \\
& + \beta_{25} prf_i + \beta_{26} skl_i + \beta_{27} npd_i + \beta_{28} ldis_i + \beta_{29} loc_i + \mu_{3i}
\end{aligned}
\qquad \textbf{5.6}
$$

where,

trn_i is a dummy variable for current training,

trp_i is a dummy variable for previous training,

pls_i is a dummy variable for people skills,

voc_i is a dummy variable for vocational skills,

bcs_i is a dummy variable for basic computer skills,

mcs_i is a dummy variable for moderate computer skills,

ccs_i is a dummy variable for complex computer skills,

sab_i is a dummy variable for studied abroad,

mgt_i is a dummy variable for management,

prf_i is a dummy variable for professionals,

skl_i is a dummy variable for skilled-production workers,

npd_i is a dummy variable for non-production workers,

$ldis_i$ is the log of distance from work, while loc_i is a dummy variable for developed states (i.e. Selangor, Kuala Lumpur, Johor, Penang, and Melaka), 0 otherwise (i.e. Terengganu, Kedah, Sabah, and Sarawak),

u_{2i} is the disturbance term that is assumed to be *iid* $\left(0,\sigma_u^2\right)$.

and the rest of the variables and parameter symbols are defined as in equation (5.5).

Based on this model, we expect that the signs of $\beta_{16},\beta_{17},\beta_{18},\beta_{19},\beta_{20},\beta_{21},\beta_{22}$ and β_{23} are positive. This is because those with more human capital, holding all other variables constant, should be more productive, and hence earn more. In addition, there is ample evidence to suggest that the more skilled an individual worker is, the more likely he/she will be rewarded. In addition, we expect $\beta_{24},\beta_{25},\beta_{26}$ and β_{27} to have a positive sign. This is because those occupations should receive a higher salary than unskilled production workers.

In terms of distance and location, we expect β_{28} and β_{29} to have a positive sign. This is because the basic urban economic theory argues that households choose their residential location to maximize their utility (Muth 1969). In this theory, individuals must decide whether they prefer to profit from living in an agglomeration and thus face higher costs of living or reside in a sparsely populated peripheral region with lower wages but also lower costs of living. Approaches that focus on individual decision making mostly imply that employees with higher wages commute longer distances. Greater housing demand for high-income households can lead to sorting of employees with high wages into longer commuting distances (Brueckner 2000). Accordingly, the primary economic explanation for commuting patterns lies in wage compensation for pecuniary and time costs. As Manning (2003) argues, monopsony and thin labour markets lead to a positive correlation between wages and commuting distance. Although workers try to maximize wages and minimize commutes, job offers come at an infrequent rate, resulting in longer commuting distances for jobs with higher wages. Thus, job search may lead to changes in commuting distances. Empirically, however, many studies (such as Manning, 2003) find only a minor positive effect on wages.

5.3.2 Estimation strategy

All constant terms and coefficients in equations 5.2 to 5.6 are estimated using Ordinary Least Squares (OLS), with robust standard errors to address heteroscedasticity. One of the shortcomings of this approach is the endogeneity issues. Endogeneity refers to the simultaneity problem where the flow of causality is not purely from the explanatory variable to the dependent variable. In other words, if we think that changes in the dependent variable may cause changes in an explanatory variable or that the dependent variable and an explanatory variable are being jointly determined, then there is simultaneity, meaning that we would not expect the error term to be uncorrelated with the explanatory variable. In our case, for example, endogeneity occurs if explanatory variables such as experience or education are not given exogenously but subject to an individual's decision, and are thereby at risk of being correlated with unobserved factors that affect the worker's pay. These factors' impact on the worker's pay is likely to be estimated with a bias, so that the estimates are not going to be consistent. That is why the OLS estimation of returns to education suffers from both attenuation and omitted ability biases simultaneously. To eliminate these biases, it is necessary to apply the Instrumental Variables (IV) estimation. However, we do not have suitable IV data such as the number of children or education level of parents to be able to correct such endogeneity problems. Therefore, we expect that by including information on formal education level, occupation, and other human capital variables, we might be able to mitigate this problem.

A separate analysis is undertaken for the pooled, male, and female samples. In the pooled sample case, we assume that the effects of worker characteristics are the same for both men and women, and there are only intercept differences captured by a gender dummy. Meanwhile, in the case of gender, we allow for full heterogeneity in pay determination by estimating separate regressions for males and females.

5.3.2.1 Quantile regression analysis

Controlling for individual unobserved heterogeneity is necessary in order to obtain unbiased estimates of the supply-side pay determinants. An alternative approach is to estimate a quantile regression (QR), and this can reveal the effects of worker characteristics at different points of the conditional pay distribution. Since individuals are located at different quantiles, this can be defined as heterogeneity in ability, wherein ability is indexed by its position in the conditional pay distribution (McGuinness and Bennett, 2007). This means that those located at the high-end of the conditional pay distribution are presumably high-ability workers whilst those located at the lower part of the pay distribution are most likely to be low-ability workers.

Moreover, the advantages of using QR are: (1) it is able to capture heterogeneity in the effects of different variables where the mean regression would not have been captured; (2) it has lesser sensitivity to outliers (Koenker & Bassett, 1978; Mwabu & Schultz, 1996; Falaris, 2004); (3) it may perform better than OLS in the case where heteroscedasticity exists (Deaton, 1997; Lee & Lee, 2006); and (4) it is less affected by deviations of error from normality (Buchinsky, 1998).

The QR model assumes that conditional on a vector of worker characteristics (X), the θ^{th} quantile of *lpay* is linear (Koenker and Basset, 1978):

$$Quant_{\theta}\left(lpay_i \middle| x_i\right) = \beta_{\theta} x_i \qquad \textbf{5.7}$$

giving rise to the linear QR model:

$$lpay_i = \beta_{\theta} x_i + \mu_{\theta i} \qquad \textbf{5.8}$$

where x_i is a vector of exogenous variables for workers i. $Quant_\theta(lpay_i|x_i)$ denotes the conditional quantile, θ^{th} of log monthly pay $(lpay)$ given x and where $Quant_\theta(\mu_\theta|x_i)=0$. The θ^{th} regression quantile, 0<θ<1, is defined as the solution to the problem.

$$min\, \beta \varepsilon R^k \left(\sum_{i:lpay_i \geq x_i\beta} \theta \left| lpay_i - x_i\beta_\theta \right| + \sum_{i:lpay_i \geq x_i\beta} (1-\theta) \left| lpay_i - x_i\beta_\theta \right| \right)$$

The above equation could be simplified as:

$$min\, \beta \varepsilon R^k \sum_i \rho_\theta(-x_i\beta_\theta)$$

where $\rho_{\theta(c)}$ is the check function defined as $\rho_{\theta(c)} = \theta_e$ if $\varepsilon \geq 0$ or $\rho_{\theta(c)} = \theta_e$ if $\varepsilon < 0$. This problem can be solved by linear programming methods, and standard errors are obtained by the bootstrap technique[42]. The calculations were carried out using 1,000 replicates, this being the usual number of replicas suggested by Davidson and Hinkley (1997). This value is acceptable, taking into account that according to the method presented by Andrews and Buchinsky (2000), the optimal number of replicas obtained varied between 800 and 1,000, depending on the regression quantile estimate[43].

Three separate regressions are estimated for the pooled, male, and female samples, while the QR estimations are conducted using the same controls as in the OLS specification. In this study, the quantiles are 0.1, 0.25, 0.5, 0.75, and 0.90. The equality

[42] Bootstrapping is a method for estimating the distribution of an estimator or test statistics by re-sampling one's data, and it provides a way of obtaining standard errors when no formula is otherwise available. The bootstrap treats the estimation data as if they were in the population and bootstrap data are generated by sampling the estimation data randomly with replacement. For details on bootstrapping methods, see Hahn (1995).
[43] Computations use Stata 12.0 software.

of the estimated coefficients of worker characteristics across quantiles can be tested using the Wald test. Two tests are proposed. The first is the test of equality of coefficients across quantiles, i.e. to ascertain whether the coefficients of worker characteristics are heterogeneous across all quantiles. The second is the inter-quantile test, i.e. to test whether the coefficients of worker characteristics between the lower quantile (q10) and upper quantile (q90) are heterogeneous. Specifically, testing the equality of coefficients across quantiles (joint test) can be written as follows:

$$H_0 : q10 = q25 = q50 = q75 = q90 = 0$$
$$H_1 : q10 \neq q25 \neq q50 \neq q75 \neq q90 \neq 0$$

If H_0 is rejected, it means that the coefficients on worker characteristics are not homogeneous throughout the workers' conditional pay distribution. Meanwhile, the inter-quantile test takes the following form:

$$H_0 : q10 - q90 = 0 \qquad \text{and} \qquad H_0 : q25 - q75 = 0$$
$$H_1 : q10 - q90 \neq 0 \qquad\qquad\qquad H_1 : q25 - q75 \neq 0$$

Accepting H_0 means that the coefficients on worker characteristics are homogeneous between the 10^{th} (25^{th}) and 90^{th} (75^{th}) quantiles.

5.4 Empirical results

In this section, we present the estimation results from the OLS estimation of pay models given in equations 5.1 to 5.6, followed by more detailed findings from the QR analysis with the same specifications as in the OLS models. For convenience, the discussion of the impact of supply-side factors (or worker characteristics) on pay determinants based on OLS and QR analyses will be divided into three sub-sections, namely: (1) education, experience, and job tenure; (2) demographic factors; and (3) trainings, skills, occupations, distance, and locations.

5.4.1 Impact of worker characteristics on worker's pay using OLS regression

This section discusses the impact of supply-side pay determinants or worker characteristics on the worker's pay, as estimated by OLS for the pooled, male and female samples.

5.4.1.1 Education, experience, and job tenure

As a first step, we present the results from the OLS estimation of the basic Mincerian model, Mincer-Jovanovic model, and 'sheepskin effects' model, as in Table 5.2. Column (1) reports the results from the basic Mincerian specification which only include education, experience and experience squared as explanatory variables In the next model, i.e. the Mincer-Jovanovic model, we are able to add tenure and tenure squared. Therefore, column (2) provides the results from the Mincer-Jovanovic model which adds tenure and tenure squared variables to the basic Mincerian model. Meanwhile, column (3) reports the results from the 'sheepskin effects' model which adds dummy variables indicating the worker's level of educational achievements.

The results in Table 5.2 indicate that all explanatory variables are significant at least at the 1 percent of significance level with expected sign. Specifically, the results for each explanatory variable will be discussed in the following. In the case of returns on education, the results show that edu_i has a positive and significant effect on the worker's pay, as predicted by the theory. Each additional year of education is associated with a pay increase of 9 percent in the basic Mincerian model. However, the return on education has decreased slightly (i.e. from 9 percent to 8.4 percent) when we control for tenure based on the Mincer-Jovanovic model. Consequently, as we take into account the sheepskin effects, we found that the return on education has decreased dramatically from 8.4 percent to 3.7 percent.

In the case of labour market experience, results from Table 5.2 show that the relationship between labour market experience and worker's pay seems to be a concave type, and a year of extra experience in the labour market increases an individual worker's pay by 3.5 percent, 2.4 percent and 3.2 percent in the models basic Mincerian, Mincer-Jovanovic, and 'sheepskin effects', respectively. Another important measure is tenure. The coefficients related to tenure suggest that each additional year in the current firm raises the worker's pay by 2.3 percent in the Mincer-Jovanovic model and 2.7 percent in 'sheep-skin effects model. Here, we see that labour market experience is just a little more rewarding when compared to tenure in both models. The estimate for quadratic term reveals that like labour market experience, the relationship between the individual worker's pay and tenure is also one of concave nature.

Apart from control for the years of completed schooling, we also control for the returns on specific credentials of education that are often referred to as "sheepskin effect"[44]. In this respect, we expect the coefficients of dummies that indicate the worker's level of educational attainment (i.e. the highest degree obtained) to pick up the marginal effect of obtaining a certificate of completion for lower secondary, upper secondary, college diploma, and university degree; and they also capture increasing returns on education[45]. As expected, edu_i is still significant and has a positive coefficient; however, it is much lower than in the previous models (refer to column (3) of Table 5.2). Meanwhile, the coefficients for each degree obtained are large and significant, indicating that employers place a much higher value on having completed one's education[46]. In fact, compared to those with only primary or no education, having completed lower and secondary education raises the worker's pay by 7.4 and 18 percent respectively, while workers with a college diploma and university degree have 54 and 79 percent higher pay, respectively.

[44] This effect understands that pay is not necessarily a linear function of time spent in school (Jaeger and Page, 1996; Antelius, 2000). In addition, the so-called 'sheepskin effect' explains the existence of pay premiums for completing the final year of elementary school, high school, or university. Therefore, it has been argued that credentials such as a college diploma or university degree are more important than a year of schooling per se. That is one reason for adding dummies for worker's credential in our model.

[45] They might also capture the signalling effects.

[46] It is also likely that more capable workers would usually have completed their education.

Table 5-2 Basic Mincerian, Mincer-Jovanovic and sheepskin effects models estimated by OLS

DV: log monthly pay	Model					
	Basic Mincerian Pay model		Mincer-Jovanovic Augmented pay model 1		Sheepskin effects Augmented pay model 2	
Explanatory Variables:	Coefficients	Robust SE	Coefficients	Robust SE	Coefficients	Robust SE
education	0.090***	0.002	0.084***	0.002	0.037***	0.003
experience	0.035***	0.002	0.024***	0.002	0.032***	0.002
experience squared	-0.000***	0.000	-0.000***	0.000	-0.001***	0.000
tenure			0.023***	0.002	0.027***	0.002
tenure squared			-0.000***	0.000	-0.000***	0.000
Educational attainment (ref – primary/ no edu)						
degree					0.792***	0.039
diploma					0.539***	0.031
upper secondary					0.180***	0.023
lower secondary					0.074***	0.02
constant	5.732***	0.028	5.808***	0.028	6.007***	0.026
No. of observation	8679		8679		8679	
R-squared	0.249		0.276		0.355	
Adjusted R-squared	0.249		0.275		0.354	

Note: *, **, and *** denote 0.1, 0.05, and 0.01, respectively.

5.4.1.2 Demographic factors

Nowadays, it is very common to include other demographic factors in the set of explanatory variables of the Mincerian semi-log specification. Therefore, in Table 5.3, results of OLS with robust standard errors based on the augmented Mincerian pay model 1 are presented. Column (1), as shown in Table 5.3, consists of estimations based on the entire sample, involving 8,679 observations. The model explains 45.4 percent pay variation in Malaysia, as indicated by R-squared. Meanwhile, Columns (2) and (3) are based on estimations of the male sample which involves 4,811 workers and the female sample which involves 3,868 workers, respectively. The R-squared value for the male sample is 46.6 percent, while for the female sample it is 43 percent.

In general, we found that almost all explanatory variables are significant at least at the 10 percent significant level, and the signs of coefficients are, as expected, in the pay determination. First, we discuss the basic human capital variables. We see that for the Malaysian labour market, education plays a significant role in the process of worker's pay determination. The estimation results show that *edu* is significant and positively related to monthly pay. Based on column 1 in Table 5.3, each additional year of schooling is associated with a 2.6 percent higher monthly pay, *ceteris paribus*.

Regarding the estimation of sheepskin effects, we found that university degree, college diploma, and upper secondary levels are significant at 1 percent, while the lower secondary level is significant at 10 percent, and the signs of their coefficients are positive. Relative to the primary level, those with lower secondary certificates have earnings that are about 3.8 percent higher. Those with upper secondary certificates earn about 16.5 percent more than those with primary. College diploma holders and university degree holders earn, respectively, 49.5 percent and 74.8 percent more than primary-level workers.

The returns on past labour market experience and job tenure are found to be 2.7 and 2.3 percent with each additional year of experience and tenure, respectively. The estimation results show that as years of work experience and tenure increase, the monthly pay will increase at a decreasing rate (as shown by the negative sign of the estimated coefficient associated with experience squared, *exp2* and tenure squared, *ten2*). The negative coefficient related to the quadratic term for experience reveals the concavity of the experience-wage relationship which is confirmed in almost all Mincer-based studies.

The effect of gender, marital status, citizenship, and ethnicity on the worker's pay is given by the variables *fem, mar, ctz, chn, ind,* and *oth*. We found that all variables except *oth* (i.e. other ethnics) are statistically significant at the 1 percent level. Based on results in column (1) in Table 5.3, we found that if a worker were female, with all other characteristics being the same as her male colleague, her earnings would be almost 23 percent less, whereas if the employee has been married, with all other characteristics being the same as his/her single colleague, his/her earnings would be 9 percent more. We also found that if a worker is a citizen, his/her earnings would be 29 percent more than his/her non-citizen colleague. In terms of ethnic differences, we can see that being Chinese and Indian (with all other attributes being the same) respectively result in an almost 28 and 5.4 percent wage premium compared to Malay workers.

Table 5-3: Augmented Mincerian pay model 1 by OLS for all workers and by gender

Log monthly Pay	(1) All workers		(2) Male workers		(3) Female workers	
	Coefficients	Robust SE	Coefficients	Robust SE	Coefficients	Robust SE
education	0.026***	0.003	0.027***	0.003	0.024***	0.005
Educational attainment (ref – primary/no edu)						
degree	0.748***	0.036	0.692***	0.046	0.809***	0.056
diploma	0.495***	0.029	0.441***	0.039	0.553***	0.045
upper secondary	0.165***	0.022	0.111***	0.028	0.229***	0.034
lower secondary	0.038*	0.019	0.006	0.024	0.078**	0.030
experience	0.027***	0.002	0.033***	0.002	0.023***	0.002
experience squared	-0.001***	0.000	-0.001***	0.000	-0.001***	0.000
tenure	0.023***	0.002	0.018***	0.003	0.030***	0.003
tenure squared	-0.000***	0.000	-0.000*	0.000	-0.000***	0.000
female	-0.230***	0.009	-	-	-	-
married	0.094***	0.011	0.1***	0.015	0.075***	0.015
citizen	0.294***	0.056	0.394***	0.062	0.051	0.096
Ethnicity (ref – Malay)						
Chinese	0.284***	0.01	0.287***	0.015	0.283***	0.014
Indian	0.054***	0.016	0.099***	0.024	0.014	0.022
others	0.077	0.056	0.134*	0.063	0.028	0.09
constant	5.922***	0.061	5.813***	0.069	5.937***	0.104

Log monthly Pay	(1) All workers		(2) Male workers		(3) Female workers	
	Coefficients	Robust SE	Coefficients	Robust SE	Coefficients	Robust SE
No. of. observation	8679		4811		3868	
R-Squared	0.454		0.466		0.43	
Adjusted R-Squared	0.453		0.464		0.428	

Note: *, **, and *** denote 0.1, 0.05, and 0.01, respectively.

As acknowledged earlier, women earn significantly less than men. For this reason, a separate analysis was also undertaken for males and females, and these results are presented in columns (2) and (3) in Table 5.3. In making a comparison by gender, human capital variables such as education, experience, and tenure have a positive and significant effect on the worker's pay. Returns on education are between 2.4 and 2.7 percent, which is slightly higher for males compared to females. Returns on experience are between 2.3 and 3.3 percent, which is higher for males. On the other hand, returns on tenure are between 1.8 and 3.0 percent, which is higher for females. In terms of the 'sheepskin effects', the pay premium for each educational attainment appears to be higher for females than for males.

In terms of demographic factors, we find that among males, marital status, citizenship, and ethnicity have positive and significant effects on the worker's monthly pay. Those who are married earn about 10 percent more. Malaysian citizens receive a 39 percent higher pay than those who are not. Chinese, Indian, and other ethnic workers respectively receive about 29, 10, and 13 percent higher pay than Malay workers. Among females, those who are married and Chinese earn respectively about 8 and 28 percent more than those who are single and Malay; while on citizenship, Indian and other ethnic variables remain insignificant.

5.4.1.3 Training, skills, occupations, distance and location

In the next pay model, we add dummies of current and previous training, computer skills[47], people skills, off-the job training, study abroad, occupations, distance, and location, as presented in equation 5.6. Table 5.4 presents the results of this model for the pooled, male, and female samples. Column (1) in Table 5.4 reports the estimation of the augmented Mincerian pay model 2 for the whole sample. The model explains the 55 percent pay variation in Malaysia, as indicated by R-squared. The results demonstrate that all incorporated variables are significant in determining the logarithm of the worker's monthly pay except for the lower secondary (*lws*).

For the human capital variables, we find that education, experience, and tenure are statistically significant at the 1 percent level with expected sign. Nonetheless, augmenting the previous model with a direct measure of training, skills, occupations, distance, and locations reduces the strength of years of education as a predictor of worker's monthly pay. The previous specifications suggest that the return on 1 additional year of education is about 2.7 percent, and falling to 1.7 percent once we control for those factors. In addition, experience appears to be worth more than years of education, with an additional year of experience adding about 3 percent increase to the worker's pay.

In terms of the 'sheepskin effects', we found that all education levels, except lower secondary, have positive and significant effects on the worker's pay. Based on column (1) in Table 5.4, the marginal effects of academic credentials on the worker's pay for

[47] The categories of computer skills dummy are: basic, moderate, complex, and none as reference.

university degree, college diploma, and secondary school are dramatically reduced from 75 percent to 43 percent, 50 percent to 25 percent, and from 17 percent to 6 percent, respectively, compared to the previous model, whereas the marginal effect of lower secondary is insignificant.

For demographic factors, we also found that the effects of gender, marital status, citizenship, and ethnicity on the worker's pay are somewhat consistent with the previous model. The dummies of training and skills are expected to pick up the marginal effect of obtaining those training and skills. The results in Table 5.4 show that all these variables have a positive as well as a strong and significant impact on the Malaysian worker's pay. Based on the pooled sample, workers who have attended current training earned 8 percent higher than those who have not. Meanwhile, workers who have attended previous training earned 4 percent higher than those who have not (refer to column (1) in Table 5.4). These results imply that current training has greater impact on the worker's pay compared to previous training. As far as computer skills are concerned, compared to those with no computer skill, having a basic computer skill raises the pay by 11 percent, while workers with moderate computer skill receive on average a higher pay by 20 percent. Workers with complex computer skills have about a 22 percent higher pay. In addition, workers who have skills in dealing with people, vocational skill or off-the job training, and those who have studied abroad received around 3 to 4 percent higher pay than those who have not.

Based on results in column (1) in Table 5.4, we can see that the types of occupation that have been included are statistically highly significant with the expected signs. The skills and characteristics found in professional workers and managers seem to be especially valuable to the firm, which pays a premium of 35 percent to professionals (such as engineers, accountants, lawyers, chemists, scientists, and software programmers) and 30 percent to managers relative to unskilled workers, even after controlling for education, experience, training and skills. Meanwhile, skilled workers (such as technicians, and supervisors) and non-production workers (such as administrative and sales workers) earned respectively 13 and 11 percent higher than unskilled production workers.

Both variables included in the model, i.e. $ldis_i$ and loc_i , are statistically significant and have a positive impact on the worker's monthly pay. This implies that as the distance from workplace increases by a kilometre, the worker's pay increases by 4 percent. Likewise, those who reside in developed states such as Selangor would receive 19 percent more pay compared to those who reside in least developed states such as Kedah.

Table 5-4 The augmented Mincerian pay model 2 by OLS robust S.E for all and by gender

DV: log monthly pay	(1) All workers		(2) Male workers		(3) Female workers	
Explanatory Variables:	Coefficients	Robust SE	Coefficients	Robust SE	Coefficients	Robust SE
education	0.017***	0.002	0.016***	0.003	0.016***	0.004
degree	0.429***	0.032	0.369***	0.041	0.482***	0.05
diploma	0.245***	0.026	0.204***	0.035	0.281***	0.04
upper secondary	0.056**	0.019	0.029	0.025	0.087**	0.03
lower secondary	0.011	0.017	-0.009	0.022	0.029	0.02
experience	0.027***	0.001	0.029***	0.002	0.025***	0.002
experience squared	-0.000***	0.000	-0.001***	0.000	-0.000***	0.000
tenure	0.020***	0.002	0.017***	0.002	0.025***	0.003
tenure squared	-0.000***	0.000	-0.000*	0.000	-0.000***	0.000
female	-0.240***	0.009	-	-	-	-
married	0.070***	0.01	0.084***	0.014	0.045***	0.013
citizen	0.199***	0.05	0.287***	0.063	0.015	0.077
Chinese	0.261***	0.01	0.260***	0.015	0.260***	0.013
Indian	0.043**	0.015	0.074***	0.021	0.016	0.02
others	0.099*	0.05	0.134*	0.063	0.072	0.074

DV: log monthly pay	(1) All workers		(2) Male workers		(3) Female workers	
Explanatory Variables:	Coefficients	Robust SE	Coefficients	Robust SE	Coefficients	Robust SE
current training	0.078***	0.009	0.063***	0.013	0.099***	0.013
previous training	0.043***	0.011	0.063***	0.016	0.019	0.015
basic comp. skills	0.113***	0.012	0.088***	0.016	0.147***	0.02
moderate comp. skills	0.204***	0.012	0.166***	0.017	0.248***	0.019
complex comp. skills	0.219***	0.02	0.173***	0.028	0.283***	0.03
people skills	0.036***	0.009	0.030*	0.013	0.044***	0.013
vocational skills	0.036**	0.013	0.03	0.018	0.041*	0.02
study abroad	0.038*	0.012	0.053*	0.023	0.046*	0.015
management	0.298***	0.017	0.372***	0.026	0.220***	0.022
professionals	0.351***	0.019	0.377***	0.027	0.320***	0.026
skilled workers	0.125***	0.011	0.149***	0.015	0.081***	0.017
non-production	0.107***	0.013	0.065***	0.02	0.098***	0.018
log of distance	0.038***	0.004	0.032***	0.006	0.041***	0.006
location	0.186***	0.011	0.179***	0.016	0.208***	0.017
constant	5.701***	0.056	5.651***	0.07	5.611***	0.088
No. of. observation	8679		4811		3868	
R-Squared	0.551		0.555		0.545	
Adjusted R-Squared	0.549		0.552		0.541	

Notes: Reference group: primary school, no formal training from current employer, no formal training from previous employer, no computer skills, in his/her job not important dealing with people, no attendance at vocational school or after-work learning program, studied locally, male, single, Malay, unskilled production workers, and live in less developed states; *** denotes statistically significant at 1%, ** denotes statistically significant at 5%, and * denotes statistically significant at 10%.

Columns (2) and (3) in Table 5.4 give the estimation results of the augmented Mincerian pay model 2 for the sample of men and women, separately. The estimation results of the human capital variables demonstrate the same pattern as the previous model. The rates of returns on education are equal among male and female workers. Returns on experience are between 2.5 and 2.9 percent, which is higher for males. On the other hand, returns on tenure are between 1.7 and 2.5 percent, which is higher for females. In terms of the ‘sheepskin effects’, the pay premiums for university degree and college diploma holders are higher for female workers than their male counterparts.

In terms of demographic factors, the results are somewhat consistent with the previous model. We found that in the case of males, factors such as marital status, citizenship, and ethnicity have positive and significant effects on the worker's monthly pay. Those who are married earn about 9 percent more compared to those who are single. In addition, local citizens earn about 29 percent higher than non-citizens. Meanwhile, Chinese, Indian, and other ethnic workers respectively receive about 26, 7, and 13 percent higher pay than Malay workers. In the case of female workers, those who are married earn about 5 percent higher compared to their single counterparts. Besides, Chinese workers earn 26 percent more than Malay workers.

In terms of training and skills, the results indicate that all variables (viz. trn_i, trp_i, bcs_i, mcs_i, ccs_i, pls_i, voc_i, and sab_i) have a positive sign and are significant at least at the 10 percent level. The results also found that differences in the rate of returns on current training between males and females are smaller (i.e. about 1 percent). On the other hand, differences in the rate of returns on previous training between males and females are somewhat higher (i.e. about 3 percent). Meanwhile, among males (and females), we found that compared to those with no computer skill, having a basic computer skill raises their pay by 9 percent (15 percent), while workers with moderate computer skills receive on average a 17 percent (25 percent) higher pay. Workers with complex computer skills have about 17 percent (28 percent) higher pay. In addition, both male and female workers who have skill dealing with people, vocational skill, and those who have studied abroad respectively received around 5 to 9 percent higher pay than those who have not.

From the results in columns (2) and (3), we note that occupations such as managers, professionals, skilled workers, and non-production workers have a significant positive effect on workers' pay in the Malaysian labour market. For managers, professionals, and skilled workers, the results indicate that males earned more than females when we compared their salary with unskilled workers in their gender category. For non-production category, however, we found that females earned more than males when we compared their salary with unskilled workers in their gender category (cf. columns (2) and (3) in Table 5.4).

Based on columns (2) and (3) in Table 5.4, there exist some similar results between the male and female samples. For instance, we found that both males and females receive a 1.6 percent return rate on every additional year of formal education. In addition, we found that males and females who are Chinese receive around 26 percent more in terms of monthly pay than their Malayan counterparts. Among the males, marital status has a significant effect on monthly pay. Those who are married earn about 8 percent more. Females who are married earn about 5 percent more than their single counterparts. For males, those who are Malaysian citizens earn about 29 percent more than non-citizens, while for females the coefficient of the dummy *ctz* variable is insignificant.

Nonetheless, there are several interesting contrasts that emerge when we compare the pay structure of the males with that for females. For example, the results show that the return on each year of experience is higher for males than for females. This result is consistent with that found by Lee and Nagaraj (1995) but at variance with that found by Chapman and Harding (1985). On the other hand, the return on each year of tenure is higher for females than for males. Turning to skills and training, we find that females receive higher returns on current training; males, on the other hand, receive higher premiums as return on previous training. In terms of skills, among females, those who have computer skills, skill dealing with people, and vocational skill earned more than those who have not. Meanwhile, among males, those who have computer skills, skill for dealing with people, and have studied abroad received a higher pay compared to those who have not.

The dummy variables for various categories of occupations are generally significant at the 1 percent level. Among the males and females, workers in all categories earn significantly more than their unskilled counterparts. The premiums of each occupational category, with the exception of non-production workers, appear to be higher for males than for females.

5.4.2 Impact of worker's characteristics on worker's pay using QR

In this section, we continue our analysis of the supply-side pay determinants in the Malaysian economy using QR. Unlike the OLS regression discussed earlier, where it is only possible to know the effect of the explanatory variables in the mean of the conditional distribution of the dependent variable, QR allows for an estimation of the effects of covariates on different points of the dependent variable distribution. Therefore, we carry out this analysis to explore the possibility that different explanatory variables uniformly affect the conditional distribution of the dependent variable or do they exert different effects on dependent variables in different quantiles of the conditional distribution of dependent variable.

We have estimated our final model (i.e. augmented Mincerian pay model 2) as QR model, and as explained in Section 5.3.2.1 we use standard quantiles, namely the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} quantiles. Tables 5.5, 5.7, and 5.9 give the QR estimation results for the pooled, male, and female samples respectively, as indicated in columns 3 – 7 of each table. As a comparison, the OLS results are also reported in the second column of those tables. With OLS, the effects of all covariates on pay distribution are assumed to only have location shifts; however, QR assumes location shifts as well as the scale and shape of the conditional pay distribution.

All included explanatory variables have the expected sign in all three samples. Very few included variables are not statistically significant or different from zero for all quantiles. In all samples, the pseudo-R squared is rising with the increasing quantile; that is, more is being explained in the high-income quantiles than in the low income quantiles of the income distribution. In the following, each explanatory variable is discussed in turn: (1) education, experience, tenure, and ‘sheepskin effect’; (2) demographic factors; (3) training and skills; (4) kinds of work; and (5) distance and locations.

5.4.2.1 Education, experience, and job tenure

In this study, QR allows observationally identical workers with different unobserved abilities to experience different pay levels and different pay paths as the values of regressors that measure worker characteristics. The coefficients of regressors may differ at different points of the conditional pay distribution and can affect pay inequality. The Wald test has been applied to test the equality of each parameter's estimates across all quantiles. In addition, the corresponding p-values for testing the equality of individual slope coefficients between two selected quantiles are also reported in the same table.

Inspection of the estimated coefficients of *edu* and *ten* in columns OLS and q10 to q90 in Table 5.5 reveals that the QR estimates are fairly uniform (around 2 percent) across the conditional pay distribution. Since the years of schooling and tenure are significantly related to monthly pay at each quantile and that the QR estimates do not differ significantly across all quantiles, it can be concluded that years of schooling and tenure only affect the location of the conditional pay distribution.

Meanwhile, in the case of 'sheepskin effect', the results show that returns on college diploma and university degree were statistically significant, different from zero, and positive for all analysed quantiles when controlling for other individual worker characteristics. However, the return on lower secondary and upper secondary qualifications are only significant for the 75^{th} and 90^{th} quantiles. In addition, the premium is the following: first, rapidly increasing with more attained education; and second, increasing across quantiles and, hence, the pay distribution. Moreover, the findings reveal a large degree of heterogeneity across the pay distribution. Workers in the low end of the pay distribution (10^{th} and 25^{th} quantile) obtain lower returns than do workers in the top end (75^{th} and 90^{th} quantile). Hence, workers with the same level of education are not compensated equally. For example, the poor person (10^{th} quantile) who has a university degree receives less pay (i.e. 42 percent higher than primary/no education) compared to the rich person (90th quantile) with similar attainment who receives a 71 percent higher pay than one with primary/no education.

Making a comparison by gender, the entire sample is disaggregated into two sub-samples, i.e. one for male workers and one for female workers (see Tables 5.7 and 5.9). The results in these tables demonstrate that edu_i are significant in all quantiles except for the lowest quantile (10th) in both male and female models. In addition, in the case of females, the rates of return on education do not differ significantly across quantiles. On the other hand, in the case of males, the rates of return on education differ significantly across all quantiles (refer to Tables 5.8 and 5.10).

Turning to the 'sheepskin effect', Tables 5.7 and 5.9 show that a university degree and college diploma have a positive and significant impact on the worker's monthly pay in all quantiles for both male and female samples. However, the income for female workers increases more rapidly with the level of educational attainment than for their male counterparts. For instance, a female worker in the median (50th) who has obtained a university degree gets a return of 70 percent, while a male worker with the same characteristic only receives 44 percent higher than those with primary or no education. Meanwhile, the marginal effect of upper secondary for females is positive and significant for all quantiles except at the lowest end (10th) quantile, while for males the marginal effect of upper secondary is insignificant for all quantiles except for the top end (90th) quantile. However, the marginal effects for lower secondary are insignificant in all quantiles as well as in the OLS for both male and female samples (refer to Tables 5.7 and 5.9). In the case of males, the Wald tests (see Table 5.8) show that the inter-quantile tests between the lowest (10th) and upper end (90th) quantile are statistically significant and different from zero but not significant in the jointly equality test for the marginal effect of university degree, while both jointly and inter-quantile tests are statistically significant and different from zero for the marginal effects of other academic qualifications. In the case of females, the Wald test (refer to Table 5.10) shows that the inter-quantile tests between the lowest (10^{th}) and upper end (90^{th}) quantile are statistically significant and different from zero for university degree and upper secondary, with other tests and qualifications being insignificant.

Results in Tables 5.7 and 5.9 also show that general experience (exp_i) and specific experience (ten_i) variables are statistically significant, different from zero, and positive for all reported quantiles in both male and female samples. Returns on experience for female workers are between 1.3 and 3.4 percent, while returns on experience among male workers are between 2.2 and 3.3 percent. Meanwhile, returns on tenure for females are between 2.1 and 2.6 percent, which is higher compared to those for their male counterparts (between 1.6 and 2.0 percent). In addition, the Wald test for general experience (refer to Tables 5.8 and 5.10) shows that both jointly and inter-quantile tests are statistically significant and different from zero, which means that the returns on experience is heterogeneous across quantiles and between the lowest (10^{th}) and upper end quantile (90^{th}). However, both jointly and inter-quantile tests suggest that the returns on tenure for both men and women are homogeneous across all quantiles and between the lower and top end quantile.

5.4.2.2 Demographic factors

QR analysis shows signs of large measurable inequalities between genders. Female workers are also found to receive lower pay as compared to male workers in all the five quantiles. The results from the Wald test in Table 5.6 suggest that the gender gap is heterogeneous across all quantiles. Furthermore, Table 5.5 reveals that pay penalty increases for women with income group. For the 10^{th} quantile, the pay penalty for women is 19 percent less than for their male colleagues and increases to 52, 28, 29, and 31 percent for the 25^{th}, 50th, 75^{th}, and 90^{th} quantile, respectively.

Turning to marital status, Table 5.5 shows that the wage premium for being married across the worker conditional pay distribution for the entire sample increases linearly with each quantile: from 6 percent at the bottom end to 7 percent at the mid quantile, and on to 11 percent at the top end of distribution. However, the Wald test (refer to Table 5.6) suggests that this premium is not homogeneous across all quantiles as well as between the lowest (10^{th}) and upper end quantile (90^{th}). By gender, the male sample closely follows the general pattern, but the Wald test shows no evidence that these premiums are heterogeneous at different parts of the worker conditional pay distribution[48]. For women, the wage premium for being married is significant at the 10^{th}, 75^{th}, and 90^{th} quantiles, while insignificant at 25^{th} and 50^{th} quantiles. In addition, the in-between coefficient differences for the married variable is significant (with p-value = 0.075) in the joint test, but not significant in the equality test between bottom and upper 10 percent as well as between the bottom and upper 25 percent.

In terms of citizenship, the result from Table 5.5 indicates that wages of local workers relative to non-citizen workers are statistically different from zero and positive for all quantiles in the pooled sample, while in the case of males, it was significant and

[48] Refer to Table 5.11 for the results of the Wald test among male workers.

positive for all except for the lowest end quantile. Meanwhile, in the case of the female sample, it was insignificant for all quantiles. The pay gap between local workers and international workers in the male sample is higher (i.e. around 22 to 44 percent) compared to the pooled sample (i.e. around 20 to 34 percent). Furthermore, the Wald test (refer to Tables 5.6, 5.8, and 5.10) demonstrates that jointly and inter-quantiles tests are insignificant in all samples.

In terms of ethnicity, the QR results indicate that wages of the Chinese relative to Malay workers are statistically different from zero and positive for all quantiles in the pooled, male, and female samples. Furthermore, the pay gap between Chinese and Malay is statistically different across all quantiles as well as between the bottom and upper 10 percent and between the bottom and upper 25 percent of the pooled sample (refer to Table 5.5). In the case of Indian-Malay, the pay gap is statistically significant, different from zero, and positive for quantiles 50^{th}, 75^{th} and 90^{th} in the pooled sample. Other ethnics' pay relative to Malay workers is positive and significant only for quantiles 25^{th} and 50^{th}. Nonetheless, Table 5.5 also envisaged that the Indian-Malay pay gap as well as other ethnics-Malay pay gap are homogeneous across and between quantiles. Meanwhile, by gender, the difference among all ethnics' pay gap in the male samples closely follows the general pattern (refer to Table 5.7). In the case of females, Table 5.9 shows that only the Chinese-Malay pay gap follows the general pattern.

5.4.2.3 Trainings, skills, occupations, distance, and locations

The QR findings indicate that training and skills are important in the Malaysian worker's pay determination, after controlling for the level of human capital and other worker characteristics. In terms of training, Table 5.5 shows that the returns on current training are relatively higher compared to previous training in all quantiles. For example, at the 50th quantile, those who have attended current (previous) training earned about 7 percent (5 percent) higher than those who did not attend current (previous) training. From Table 5.6, we can see that the QR estimates of the association of previous training with the worker's pay differ significantly in the equality test between the bottom (10th) and upper (90th) quantiles (with p-value= 0.047), but not significant in the joint test among all five quantiles. Meanwhile, the same table shows that the Wald test for current training is insignificant for both jointly and inter-quantile tests. The implication is that current training only affects the location of the conditional pay distribution, but not the shape of the distribution.

Furthermore, in comparison by gender, Tables 5.7 and 5.9 indicate that female workers received slightly higher returns on current training (i.e. around 9 to 10 percent) compared to male ones (i.e. between 5 and 8 percent). However, these tables also reveal that male workers received returns on previous training at around 5 to 10 percent, while female workers did not receive any return on previous training at all quantiles. Nonetheless, the Wald tests for male and female samples (refer to Tables 5.8 and 5.10) suggest that jointly and inter-quantile tests are not significant for both current and previous training. These results imply that the returns on current and previous training are homogeneous across and between quantiles.

In terms of computer skills, relative to the base of no computer skills at all, the estimated coefficients of all the computer skill dummies reveal an association between basic, moderate, and complex computer skills and worker's pay increasing across quantiles as well as across levels of computer skills, where the higher the level of computer skills, the higher the worker will earn relative to having no computer skills (refer to Table 5.5). In addition, the results also indicate that workers who have skills for dealing with people received around 3 to 5 percent higher pay compared to those without that skill at all quantiles except for the top quantile. Moreover, we also found that those who have vocational skill earned 4 to 6 percent higher pay compared to those who did not have any vocational skill for all quantiles except for the bottom end (10^{th}) and top end (90^{th}) quantiles. The Wald test (Table 5.6) indicates that both jointly and inter-quantile tests are insignificant, which means that returns on dealing with people and vocational skills are homogeneous across and between quantiles.

Table 5.5 also demonstrates that all included occupational categories are statistically significant at 1 percent level of significance. This indicates that workers employed as a professional obtain the highest return (for the median worker, it is 42 percent), and with the management category receiving the second highest return (32 percent). Skilled-workers and non-production workers obtain 12 and 10 percent premium, respectively. Interestingly, these results seem to be consistent with OLS. In addition, Table 5.6 reveals that only the returns on skilled-workers differ significantly across all quantiles with p-value at 0.025, while the QR estimates for other occupational categories do not differ significantly across quantiles. Furthermore, results from the Wald test in Table 5.6 also envisaged that returns on manager in the 10^{th} quantile differ notably from that of manager in the 90^{th} quantile.

Based on Table 5.5, we also find location to be a significant determinant of worker’s pay. This implies that workers living in the developed states namely Selangor, Kuala Lumpur, Johor, Penang, and Melaka, are compensated in the form of significant and positive wage premiums at all quantiles in the pooled, male, and female samples. These results envisaged that higher wages paid to employees in line with cost of living in a particular geographical location. In this respect, cost of living is higher in developed states such as Kuala Lumpur (CPI = 2.34), Johor (CPI= 2.78), Penang (CPI= 2.45), and Melaka (CPI= 1.92) compared to that of the least developed states such as Kedah (CPI= 1.65), Terengganu (CPI= 1.85), Sabah (CPI= 0.88), and Sarawak (CPI= 1.45)[49]. In addition, based on Table 5.6, the in-between coefficient differences for the location variable is significant (with p-value = 0.088) in the joint test, but not significant in the equality test between bottom and upper 10 percent as well as between the bottom and upper 25 percent. Based on these results one can conclude that the location premium is heterogeneous across quantiles.

[49] Refer DOSM (2015).

Table 5-5: Augmented Mincerian pay model 2 by the OLS robust S.E and QR – All workers

Log monthly pay	OLS	qr10	qr25	qr50	qr75	qr90
education	0.017***	0.011**	0.015***	0.019***	0.019***	0.016***
degree	0.429***	0.351***	0.399***	0.442***	0.502***	0.539***
diploma	0.245***	0.164***	0.209***	0.249***	0.308***	0.351***
upper secondary	0.056**	0.005	0.012	0.052	0.091***	0.160***
lower secondary	0.011	-0.033	-0.033	0.014	0.049*	0.078*
experience	0.027***	0.016***	0.024***	0.027***	0.034***	0.029***
experience^2	-0.00***	-0.000***	-0.000***	-0.000***	-0.001***	-0.000***
tenure	0.020***	0.020***	0.021***	0.022***	0.019***	0.022***
tenure^2	-0.00***	-0.000***	-0.000**	-0.000**	-0.000*	-0.000**
female	-0.24***	-0.176***	-0.221***	-0.252***	-0.256***	-0.271***
married	0.070***	0.055***	0.055***	0.067***	0.072***	0.106***
citizen	0.199***	0.257*	0.178***	0.269**	0.198**	0.199**
Chinese	0.261***	0.181***	0.264***	0.291***	0.292***	0.277***
Indian	0.043**	0.009	0.026	0.049*	0.038*	0.065*
others	0.099*	0.209	0.128**	0.179*	0.068	0.023
current training	0.078***	0.081***	0.073***	0.070***	0.083***	0.087***
previous training	0.043***	0.030	0.040**	0.051***	0.060***	0.081***
basic comp. skills	0.113***	0.090***	0.091***	0.101***	0.110***	0.152***
moderate comp. skills	0.204***	0.197***	0.205***	0.198***	0.190***	0.195***
complex comp. skills	0.219***	0.214***	0.189***	0.201***	0.221***	0.225***
people skills	0.036***	0.033*	0.030*	0.049***	0.033**	0.016
vocational skills	0.036**	0.038	0.055**	0.046**	0.038*	0.019
study abroad	0.038	-0.014	-0.012	-0.004	0.073**	0.127***
management	0.298***	0.245***	0.262***	0.276***	0.298***	0.338***
professionals	0.351***	0.322***	0.359***	0.353***	0.330***	0.329***
skilled workers	0.125***	0.071***	0.096***	0.121***	0.131***	0.140***
non-production	0.107***	0.086***	0.109***	0.095***	0.111***	0.087**
log of distance	0.038***	0.028***	0.035***	0.041***	0.037***	0.028**
location	0.186***	0.174***	0.199***	0.215***	0.190***	0.170***
constant	5.701***	5.492***	5.581***	5.560***	5.806***	6.054***
R^2 / *Pseudo* R^2	0.551	0.245	0.316	0.368	0.371	0.355
No. of observation	8679	8679	8679	8679	8679	8679

Notes: Reference group: primary school, no formal training from current employer, no formal training from previous employer, no computer skills, in his/her job not important dealing with people, no attendance at vocational school or after-work learning program, studied locally, male, single, Malay, unskilled production workers, and live in less developed states; *** denotes statistically significant at 1%, ** denotes statistically significant at 5%, and * denotes statistically significant at 10%.

Another major advantage that QR has over OLS is that the lower secondary (*lws*) and study abroad (*sab*) variables become significant at some points of the pay distribution, after having been reported as non-significant in the OLS model. These two variables are found to be non-significant in the lower half of the pay distribution, while significant in the upper half of the pay distribution. For instance, returns on lower secondary at the 75th and 90th quantiles are respectively 5 and 8 percent higher than primary/no education, but insignificant at the 10th, 25th, and 50th quantiles.

Table 5-6: Test of slope coefficient equality across quantiles

	Marginal significance levels (p-values)		
Explanatory variables	**All quantiles**	**Quantile 0.10 & 0.90**	**Quantile 0.25 & 0.75**
education	0.285	0.247	0.288
degree	0.026**	0.002***	0.028**
diploma	0.005***	0.000***	0.011**
upper secondary	0.000***	0.000***	0.003***
lower secondary	0.006***	0.001***	0.000***
experience	0.000***	0.000***	0.000***
experience squared	0.000***	0.047**	0.018**
tenure	0.527	0.652	0.633
tenure squared	0.426	0.839	0.399
female	0.000***	0.000***	0.006***
married	0.060*	0.021**	0.240
citizen	0.680	0.637	0.376
Chinese	0.000***	0.000***	0.068*
Indian	0.411	0.122	0.576
others	0.263	0.123	0.308
current training	0.803	0.773	0.494
previous training	0.395	0.047**	0.243
basic comp. skills	0.255	0.035**	0.314
moderate comp. skills	0.948	0.953	0.437
complex comp. skills	0.701	0.826	0.220
people skills	0.268	0.428	0.876
vocational skills	0.691	0.566	0.405
study abroad	0.002***	0.001***	0.006***
management	0.279	0.027**	0.181
professionals	0.654	0.891	0.366
skilled workers	0.025**	0.011**	0.026**
non-production	0.385	0.996	0.920
log of distance	0.249	0.976	0.679
location	0.088*	0.864	0.586

Notes: Reference group: primary school, no formal training from current employer, no formal training from previous employer, no computer skills, in his/her job not important dealing with people, no attendance at vocational school or after-work learning program, studied locally, male, single, Malay, unskilled production workers, and live in less developed states; *** denotes statistically significant at 1%, ** denotes statistically significant at 5%, and * denotes statistically significant at 10%.

Table 5-7: Augmented Mincerian pay model 2 by the OLS robust S.E and QR – Male workers

Log monthly pay	OLS	qr10	qr25	qr50	qr75	qr90
education	0.016***	0.007	0.017***	0.022***	0.017***	0.016**
degree	0.369***	0.266***	0.313***	0.364***	0.463***	0.454***
diploma	0.204***	0.136**	0.134**	0.202***	0.281***	0.310***
upper secondary	0.029	-0.022	-0.017	0.013	0.071	0.120*
lower secondary	-0.009	-0.047	-0.059	-0.015	0.036	0.062
experience	0.029***	0.022***	0.027***	0.033***	0.033***	0.031***
experience squared	-0.001***	-0.000***	-0.001***	-0.001***	-0.001***	-0.001***
tenure	0.017***	0.020***	0.016***	0.016***	0.015***	0.018***
tenure squared	-0.000*	-0.000**	0.000	0.000	0.000	0.000
female	0.084***	0.061**	0.093***	0.077***	0.096***	0.100***
married	0.287***	0.158	0.197**	0.363***	0.314***	0.329*
citizen	0.260***	0.173***	0.270***	0.299***	0.296***	0.294***
Chinese	0.074***	0.017	0.083**	0.085**	0.083*	0.085
Indian	0.134*	0.066	0.111	0.243**	0.117	0.092
others	0.063***	0.081***	0.049**	0.051***	0.069***	0.084**
current training	0.063***	0.042	0.052**	0.083***	0.091***	0.095**
previous training	0.088***	0.086***	0.079***	0.081***	0.084***	0.103**
basic comp. skills	0.166***	0.165***	0.178***	0.161***	0.143***	0.140***
moderate comp. skills	0.173***	0.215***	0.179***	0.147***	0.136**	0.133*
complex comp. skills	0.030*	0.025	0.01	0.037*	0.034	0.01
people skills	0.03	0.049	0.057*	0.048*	0.007	-0.009
vocational skills	0.053*	0.009	-0.007	0.015	0.087**	0.139***
study abroad	0.372***	0.377***	0.374***	0.360***	0.363***	0.396***
management	0.377***	0.344***	0.397***	0.372***	0.347***	0.363***
professionals	0.149***	0.125***	0.147***	0.155***	0.128***	0.137***
skilled workers	0.065***	0.077**	0.078***	0.064**	0.042	0.052
non-production	0.032***	0.026**	0.027***	0.035***	0.035***	0.030**
log of distance	0.179***	0.186***	0.195***	0.194***	0.167***	0.165***
location	5.651***	5.579***	5.544***	5.459***	5.790***	5.979***
R^2 / *Pseudo* R^2	0.555	0.253	0.324	0.373	0.376	0.363
No. of observations	4811	4811	4811	4811	4811	4811

Notes: Reference group: primary school, no formal training from current employer, no formal training from previous employer, no computer skills, in his/her job not important dealing with people, no attendance at vocational school or after-work learning program, studied locally, male, single, Malay, unskilled production workers, and live in less developed states; *** denotes statistically significant at 1%, ** denotes statistically significant at 5%, and * denotes statistically significant at 10%.

Table 5-8: Test of slope coefficient equality across quantiles among male workers

	Marginal significance levels (p-values)		
Explanatory variables	**All quantiles**	**Quantile 0.10 & 0.90**	**Quantile 0.25 & 0.75**
education	0.034**	0.200	0.889
degree	0.146	0.046**	0.032**
diploma	0.086*	0.029**	0.009***
upper secondary	0.084*	0.013**	0.025**
lower secondary	0.074*	0.034**	0.006***
experience	0.024**	0.055*	0.089*
experience squared	0.370	0.621	0.609
tenure	0.705	0.713	0.755
tenure squared	0.338	0.344	0.818
female	0.339	0.239	0.886
married	0.207	0.263	0.175
citizen	0.000***	0.000***	0.287
Chinese	0.311	0.248	0.992
Indian	0.307	0.863	0.945
others	0.327	0.933	0.326
current training	0.398	0.170	0.129
previous training	0.965	0.660	0.862
basic comp. skills	0.689	0.538	0.146
moderate comp. skills	0.695	0.254	0.348
complex comp. skills	0.441	0.650	0.271
people skills	0.309	0.187	0.082*
vocational skills	0.021**	0.013**	0.007***
study abroad	0.938	0.774	0.800
management	0.664	0.802	0.257
professionals	0.437	0.725	0.415
skilled workers	0.827	0.593	0.227
non-production	0.760	0.793	0.344
log of distance	0.719	0.554	0.245

Notes: Reference group: primary school, no formal training from current employer, no formal training from previous employer, no computer skills, in his/her job not important dealing with people, no attendance at vocational school or after-work learning program, studied locally, male, single, Malay, unskilled production workers, and live in less developed states; *** denotes statistically significant at 1%, ** denotes statistically significant at 5%, and * denotes statistically significant at 10%.

Table 5-9: Augmented Mincerian pay model 2 by the OLS robust S.E and QR – Female workers

Log monthly pay	OLS	qr10	qr25	qr50	qr75	qr90
education	0.016***	0.008	0.013*	0.013**	0.017***	0.018**
degree	0.482***	0.436***	0.467***	0.528***	0.540***	0.621***
diploma	0.281***	0.233***	0.249***	0.319***	0.351***	0.360***
upper secondary	0.087**	0.072	0.068*	0.103**	0.107*	0.182***
lower secondary	0.029	0.029	-0.001	0.032	0.045	0.085
experience	0.025***	0.013***	0.022***	0.026***	0.034***	0.034***
experience squared	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***	-0.001***
tenure	0.025***	0.021***	0.025***	0.029***	0.025***	0.026***
tenure squared	-0.000***	-0.000*	-0.000**	-0.000***	-0.000*	-0.000***
female	0.045***	0.056**	0.023	0.023	0.045*	0.090***
married	0.015	0.213	0.082	-0.034	0.009	0.059
citizen	0.260***	0.189***	0.271***	0.281***	0.267***	0.251***
Chinese	0.016	0.003	0.008	0.019	0.008	0.027
Indian	0.072	0.226	0.147	0.012	-0.004	0.091
others	0.099***	0.091***	0.103***	0.090***	0.102***	0.088***
current training	0.019	0.013	0.019	0.026	0.034	0.047
previous training	0.147***	0.084***	0.076***	0.136***	0.156***	0.192***
basic comp. skills	0.248***	0.202***	0.205***	0.245***	0.257***	0.217***
moderate comp. skills	0.283***	0.178***	0.184***	0.298***	0.305***	0.297***
complex comp. skills	0.044***	0.046*	0.046**	0.053**	0.031	0.01
people skills	0.041*	0.033	0.071**	0.034	0.037	0.037
vocational skills	0.046	-0.044	0.089	0.049	0.113*	0.069
study abroad	0.220***	0.180***	0.179***	0.195***	0.219***	0.290***
management	0.320***	0.282***	0.337***	0.308***	0.309***	0.333***
professionals	0.081***	0.005	0.031	0.061**	0.100***	0.195***
skilled workers	0.098***	0.064*	0.111***	0.089***	0.102***	0.097*
non-production	0.041***	0.030***	0.041***	0.043***	0.034***	0.030*
log of distance	0.208***	0.174***	0.220***	0.231***	0.223***	0.187***
location	5.611***	5.388***	5.463***	5.639***	5.701***	5.820***
R^2 / *Pseudo* R^2	0.545	0.248	0.315	0.365	0.362	0.339
No. of observations	3868	3868	3868	3868	3868	3868

Notes: Reference group: primary school, no formal training from current employer, no formal training from previous employer, no computer skills, in his/her job not important dealing with people, no attendance at vocational school or after-work learning program, studied locally, male, single, Malay, unskilled production workers, and live in less developed states; *** denotes statistically significant at 1%, ** denotes statistically significant at 5%, and * denotes statistically significant at 10%.

Table 5-10: Test of slope coefficient equality across quantiles among female workers

	Marginal significance levels (p-values)		
Explanatory variables	**All quantiles**	**Quantile 0.10 & 0.90**	**Quantile 0.25 & 0.75**
education	0.757	0.245	0.439
degree	0.404	0.076*	0.336
diploma	0.415	0.106	0.107
upper secondary	0.217	0.062*	0.452
lower secondary	0.363	0.276	0.296
experience	0.000***	0.000***	0.001***
experience squared	0.004***	0.001***	0.034**
tenure	0.390	0.316	0.924
tenure squared	0.566	0.452	0.418
female	0.075*	0.269	0.331
married	0.618	0.495	0.505
citizen	0.000***	0.041**	0.862
Chinese	0.960	0.692	0.992
Indian	0.505	0.528	0.178
others	0.797	0.912	0.979
current training	0.921	0.349	0.564
previous training	0.014**	0.018**	0.008***
basic comp. skills	0.268	0.735	0.077*
moderate comp. skills	0.021**	0.076*	0.012**
complex comp. skills	0.552	0.252	0.518
people skills	0.471	0.924	0.291
vocational skills	0.462	0.393	0.721
study abroad	0.196	0.028**	0.261
management	0.683	0.433	0.560
professionals	0.000***	0.000***	0.013**
skilled workers	0.359	0.438	0.739
non-production	0.526	0.976	0.507
log of distance	0.075*	0.744	0.900

Notes: Reference group: primary school, no formal training from current employer, no formal training from previous employer, no computer skills, in his/her job not important dealing with people, no attendance at vocational school or after-work learning program, studied locally, male, single, Malay, unskilled production workers, and live in less developed states; *** denotes statistically significant at 1%, ** denotes statistically significant at 5%, and * denotes statistically significant at 10%.

5.5 Conclusions

This chapter set out with the objective of examining the effects of the worker's characteristics on worker's pay in the Malaysia economy using the Malaysian WLD. Compared to previous studies, analyses of pay determinants using the Malaysian WLD have been able to explain more than 50 percent of the individual worker’s pay determinants in Malaysian manufacturing. In addition, the OLS and QR results in our findings are somewhat consistent and almost all workers’ characteristics included in the model are statistically and highly significant.

Findings from this chapter seem to highlights the importance of human capital variables in determining the individual worker’s earning power. Based on the findings, higher education level is the key determinant of the individual worker’s pay. Moreover, from the QR analysis, this study also suggested that workers with the same level of education are not compensated equally. Apart from education level, training also play an important role in determining workers’ pay. Workers who attended training receive a higher pay than those without training. Interestingly, training from current employer has a bigger impact on pay than training from a previous employer or off-the-job training.

Apart from the human capital variable, other factors such as demographic factors, occupation, location, and distance from home to workplace are also important in determining workers’ pay. The results also suggested that females earn less than males, married people earn more than singles, local workers earn more than non-citizen workers, and Chinese and Indians seem to have better pay than Malays. Moreover, workers in professional employment and management are paid significantly higher salaries than those in other types of jobs. Besides, workers who live in developed region receive higher wage premiums compared to those who live in least developed ones.

Even though education level and training are important in determining workers' pay, the fact of the matter is that only 26.4 percent of the Malaysian workforce had tertiary certification, while more than half of those employed in 2014 only had a secondary education (DOSM, 2015), while about 6.6 million Malaysian workers are low-skilled (Khazanah Research Institute, 2015). These circumstances have occurred due to certain obstacles being faced by employers in their effort to provide training for their workers. For example, some employers argued that: (1) training is not affordable because of limited resources; (2) training is costly because of high labour turnover; (3) firms lack knowledge about training techniques and organization; (4) and the firm uses a mature technology, so learning by doing is sufficient (ILO, 2008).

To address this issue, the Malaysian government has introduced training schemes such as Double Deduction Incentives for Training (DDIT)[50] and Human Resource Development Fund (HRDF). Under the DDIT Scheme, employers could send their workers to approved training institutions including SIRIM, NPC, CIAST, German-Malaysia Institute (GMI), SDCs in Penang and Perak, and various public training institutes such as ITIs and IKMs. Alternatively, under this scheme employers could also apply directly to MIDA for approval of their planned training programmes. Meanwhile, the HRDF scheme provides greater flexibility to employers in choosing training and advanced education programmes for their workers. In this respect, employers are allowed to provide financial assistance to: (1) help workers pursue masters or doctoral degrees, particularly in new and high technology areas; (2) train

[50] The objective of Double Deduction Incentive for Training (DDIT) was to encourage firms to train workers especially in skill areas related to new products as well as processes and productivity and quality improvement by permitting employers to deduct double the amount of allowable training expenses on their tax return.

workers despite employers having outstanding unpaid levies or outstanding interest on levies; and (3) provide practical training at their premises to students of universities or training institutions. Among training activities under the HRDF scheme are Computer-Based Training Scheme, Technology and Computer-Aided Training Scheme, English Language Programmes for Workers, Industrial Training Scheme, and SME Training Partners Scheme.

CHAPTER 6 : THE EFFECTS OF EMPLOYER CHARACTERISTICS ON THE AVERAGE FIRM-LEVEL PAY RATES

6.1 Introduction

The previous chapter has concluded that from the employees' perspective, their characteristics (particularly level of education, skills and training) played an important role in determining the individual worker's pay, at least in Malaysia. However, it is interesting to explore what factors would drive pay determinants from the Malaysian employer's perspective. Furthermore, in the empirical review in Chapter 2, it was suggested that employers' characteristics (such as firm size, profit, and firm performance) are crucial in determining the pay rates. In addition, studies on pay determinants at the firm-level in Malaysia remain somewhat limited.

The aim of this chapter is to explore the impact of employers' characteristics on determinants of the average firm-level pay rates using the Malaysian WLD. Moreover, the theory of imperfect competition in the labour market has also highlighted the importance of employers' characteristics in influencing firm-level pay rates. Apart from Athukorala and Devadason (2011), the role played by employer characteristics in this regard is relatively unexplored. In addition, most empirical studies on pay formation in Malaysia that have been reviewed do not account explicitly for the market structure; and if it does, it only uses a perfectly competitive structure. Therefore, this chapter will also provide some evidence on pay determinants in the Malaysian economy at the firm-level with a more detailed analysis that explicitly allows for an imperfectly competitive structure, i.e. monopsony.

This chapter is organized as follows. Section 6.2 discusses the theoretical framework of the study. Section 6.3 sets out the empirical methods used and provides some descriptive data on the Malaysian FLD that will be used in this chapter. Section 6.4 presents the empirical results, and Section 6.5 concludes with the findings of the chapter.

6.2 Theoretical framework

In the case of Malaysia, most previous studies have not examined the wage elasticity of labour confronting a firm. Manning (2003a), in his book entitled *Monopsony in Motion*, had raised the question: "what happens if an employer cuts the wage paid to his workers by one cent?" In a perfectly competitive labour market, assuming that the labour supply curve facing the firm is infinitely elastic, this would result in all workers immediately leaving the firm. In contrast, Manning argued that the labour market under imperfect competition behaves differently than when under perfect competition because of two assumptions. Firstly, there are important frictions in the labour market, such that employers have market power over their workers. Secondly, employers set wages as a way of exercising this market power. In an imperfect competition, the supply labour curve facing the firm is not infinitely elastic. In this chapter, the Manning monopsony model will be adopted as a vehicle for estimating the wage equation for Malaysia using the firm-level dataset. The monopsony model has never been employed in the Malaysian context, and this study will attempt to fill that gap.

6.2.1 Static model of monopsony

In our study, the static model of monopsony follows that by Manning (2003, Chapter 2). Suppose that in the labour market there is only one single firm that pays a wage *w* to all workers. Let *N(w)* denotes the labour supply curve to the firm and *w (N)* its inverse. Given a level of employment *N*, the total labour costs are *w (N)N*, and revenue function is *Y(N)* where the price of output is normalised to 1. The firm maximizes profits π optimally choosing the level of employment (*N)*

$$\pi = Y(N) - w(N)N \tag{6.1}$$

This leads to the first order condition for profit maximization that equates marginal revenue with marginal cost, such that

$$Y'(N) = w(N) + w'(N)N \tag{6.2}$$

The left-hand side of equation 6.2 is the marginal revenue product of labour (MRPL). Given the usual assumption that the MRPL is declining in employment (*N)*, this implies that the employer with monopsony power will hire less labour and pay lower wages than an otherwise equivalent employer in a competitive labour market.

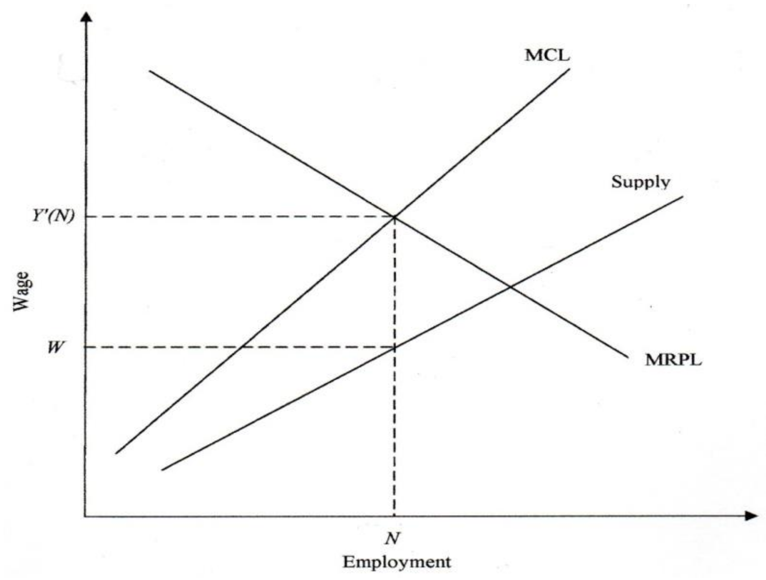
The right-hand side is the marginal cost of labour (MCL). The MCL has two parts. First, the wage, *w*, that must be paid to the newly hired worker. Second, the increase in wages, *w'*, that must be paid to all existing workers. Equilibrium is on the labour supply curve with the wage paid to workers being less than their MRPL.

Although the firm is making positive profit on the marginal worker, there is no incentive to increase employment because doing so would require increasing the wage (to extract the extra worker), and this higher wage must be paid not just to the new worker but also to all the existing workers. One particular useful way of representing the choice of the firm is to consider the marginal cost of labour as a mark-up on the wage. The mark-up being given by the elasticity of the labour curve facing the firm is $\varepsilon Nw = wN'(w)/N(w)$, and let ε be the inverse of this elasticity. Then, equation 6.2 can be written as

$$\frac{Y' - w}{w} = \frac{1}{\varepsilon_{Nw}} = \varepsilon \qquad \textbf{6.3}$$

where the proportional gap between the wage and MRPL is a function of the elasticity of labour supply curve facing the firm, which is referred to the rate of exploitation (Pigou, 1924; Hicks, 1932). A benchmark case is given by a perfectly competitive labour market where $\varepsilon Nw = \infty$ and $\varepsilon = 0$ in equation 6.3 indicating that wage will be equal to the MRPL. The working hypothesis is that the labour supply elasticity is positive but low and quite far from the competitive benchmark. The whole analysis can be summarised in Figure 6.1. Based on this figure, the graph shows that employment is determined where the marginal product is equal to the marginal cost of labour, with a lower equilibrium wage and lower employment than the competitive outcome.

Figure 6.1: The static model of monopsony



Source: Manning (2003)

6.2.2 The correlations between employer characteristics and pay rates

Let us consider that all employers face the same supply curve of labour, *N(w)*, but differ in their revenue function, Y (N, A), where the difference in *A* is the source of employer heterogeneity. Assume that $\frac{\partial Y}{\partial A} > 0$, so an increase in *A* is a positive shock for the employer. For instance, we know that firms differ in terms of the technologies they use. Therefore, in this case, A can be an advancement in technology such as the effects of robotic technologies that cause shifts in the MRPL.

Obviously, each employer will want to choose the level of employment (or, equivalently, the pay) to maximize profit:

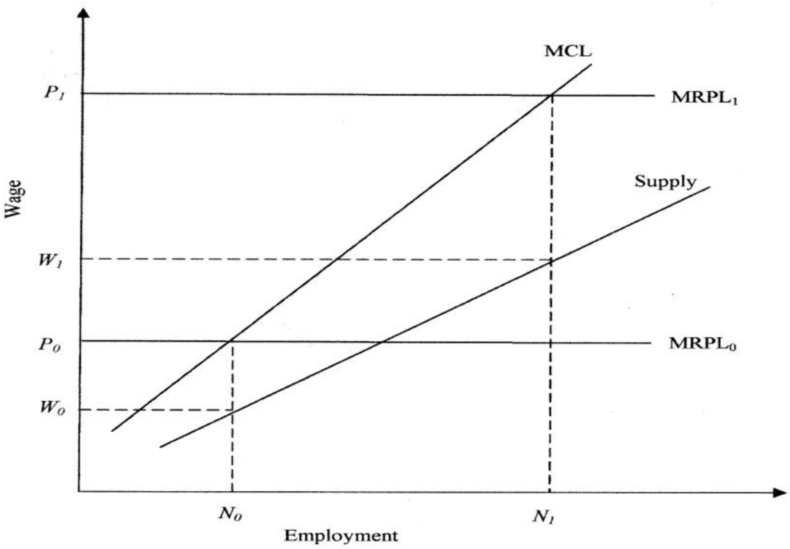
$$\pi = Y(N,A) - w(N)N \qquad \textbf{6.4}$$

Leading to the first-order condition

$$\frac{\partial Y(N,A)}{\partial N} = w(N) + \frac{\partial w(N)}{\partial N}N = w(N)[1+\varepsilon(N)] \qquad \textbf{6.5}$$

where *w(N)* is the inverse of the labour supply curve to the firm, and $\varepsilon(N)$ is the inverse of the wage elasticity of the labour supply curve facing the firm. An increase in *A* raises both the average and marginal revenue product of labour, so that an increase in *A* raises the left-hand side of equation 6.5 and the optimal wage rises. There is then a positive correlation between the level of profit and that of pay. This statement can also be explained by Figure 6.2.

Figure 6.2 : Relationship between employer heterogeneity and worker's pay



Source: Manning (2003)

Based on Figure 6.2, an increase in the marginal revenue product of labour (MRPL) curve from P_0 to P_1 will also increase the optimal wage paid by w_0 to w_1. Profitable firms have a high demand for labour and can only get extra labour by paying higher wages. Meanwhile, in examining the correlation between profit per worker and pay rates, we are interested in knowing how variations in A affect $\frac{\pi}{N} = \frac{Y}{N} - w$. If we denote the elasticity of the revenue function with respect to N by $\alpha(N,A)$, then we have

$$\frac{\pi}{N} = \frac{Y}{N} - w = \frac{1}{\alpha(N,A)} \frac{\partial Y}{\partial N} - w = w\left[\frac{1+\varepsilon(N)}{\alpha(N,A)} - 1\right] \qquad \textbf{6.6}$$

Based on equation 6.6, if both the revenue function and labour supply function are iso-elastic, then the model predicts a positive correlation between profits per worker and wages. It is possible to overturn this if the labour supply function is not iso-elastic: in particular, if ε is declining in N as then the right-hand side of equation 6.6 could conceivably by declining in the wage.

In general, this section has shown how monopsony can explain the correlations between employer characteristics and wages. More specifically, this section attempts to explain the positive link between employer size and wages utilizing the static monopsony model. Assuming that firm i has a revenue function, this is given by

$$Y_i = \frac{1}{1-\eta} A_i N_i^{1-\eta} \qquad \textbf{6.7}$$

where A_i is a shock to the MRPL curve. We further assume that on the supply-side of the labour market, the wage that the firm pays is given by

$$w_i = B_i N_i^{\varepsilon} \qquad \textbf{6.8}$$

where B_i is a shock to the supply curve. In this case, these supply shocks represent differences in local market conditions (due to regional differences or skill differences) or differences in the attractiveness of non-wage attributes among firms. We are interested in determining a consistent estimate of ε, namely, the inverse elasticity of the labour supply curve facing the firm.

The firm will choose a level of employment, *N*, where the MRPL equals the MCL, so that the chosen level of employment, *N*, will satisfy

$$A_i N_i^{-\eta} = (1+\varepsilon) B_i N_i^{\varepsilon} \qquad \textbf{6.9}$$

or, in log-linear form

$$\log(N_i) = \frac{1}{\varepsilon+\eta}\left[a_i - b_i - \ln(1+\varepsilon)\right] \qquad \textbf{6.10}$$

where $a = \log(A)$ and $b = \log(B)$. The chosen wage will be given by

$$\log(w_i) = \frac{1}{\varepsilon+\eta}\left[\varepsilon a_i + \eta b_i - \varepsilon \ln(1+\varepsilon)\right] \qquad \textbf{6.11}$$

If A_i are positive shocks to MRPL, then employment and wages will increase, even if there is only a minor effect on wages to the extent that employers do have some labour market power $(\varepsilon > 0)$. Meanwhile, if B_i are positive shocks to the labour supply curve, then employment will decrease while wages will increase.

Now, let's make the following assumptions about the observability of the shocks (a, b)

:

$$a_i = \beta_a x_i + v_{ai}$$
$$b_i = \beta_b x_i + v_{bi} \qquad \textbf{6.12}$$

where x is a set of explanatory variables. For the sake of notational simplicity, we assume that the same variables affect both *a* and *b*. Of course, a particular variable can be constrained to affect only the demand or supply shocks by imposing a restriction whereby its coefficient in the other equation is zero. Assume that shocks *v* are independent of *x* and jointly distributed with the mean zero and covariance matrix $\sum$. Denote by σ_a^2 the variance of v_a, σ_b^2 the variance of v_b and σ_{ab} the covariance between v_a and v_b.

Now consider how one might set about estimating ε. First, one might think about estimating the relationship between the log wage and log employment by OLS, controlling for other factors (*x*) thought to be relevant. A regression of log (w_i) on $(\log(N_i), x_i)$ estimates $E(\log(w_i) | \log(N_i), x_i)$. The following proposition tells us what we may expect to find.

Running a regression of log (w_i) on $(\log(N_i), x_i)$ estimates

$$E(\log(w_i) | \log(N_i), x_i) = (\varepsilon + \rho(\varepsilon + \eta))\log(N_i)$$
$$+ \rho \ln(1+\varepsilon) + (\beta_b - \rho(\beta_a - \beta_b))x_i \qquad \textbf{6.13}$$

where

$$\rho \equiv \frac{\sigma_{ab} - \sigma_b^2}{\sigma_a^2 + \sigma_b^2 - 2\sigma_{ab}} \qquad \textbf{6.14}$$

Equation 6.13 says that this approach will only give an unbiased estimate of ε if $\rho = 0$, which implies that v_a can be written as v_b plus some uncorrelated noise. A special case for this is when there are no unobserved supply shocks. In this case, all firms have the same labour supply curve (conditional on *x*), while variation on *N* caused by unobserved demand shocks will trace out the labour supply curve. If v_a and v_b are uncorrelated, the estimates of ε have a downward bias as in equation 6.14, implying that $\rho < 0$. Intuitively, unobserved shifts in the labour supply curve cause wages and employment to move in opposite directions, making the slope of the supply curve less positive than it really is.

Equation 6.13 can also be used to understand the argument that the estimated employer-size wage effect overstates the true value of ε (which must be the case if one believes that labour markets are competitive and $\varepsilon = 0$). One would expect high-quality workers to have a high level of *a* (as their productivity is high) and a high level of *b,* as *b* will partly reflect the wages paid by other firms. So, one would expect the unobserved labour quality to result in $\sigma_{ab} > \sigma_b^2$ or, equivalently, that the expectation of (a – b) be increasing in b. If, for example, proportional differences in a are reflected in proportional differences in b, then this is exactly the situation in which we can obtain an unbiased estimate of ε.

6.3 Empirical methods

In order to examine the role played by employer characteristics in determining the average firm-level pay rates in Malaysia, we adapted the static monopsony model by

Manning (2003), which has been discussed earlier. In this respect, we include employer characteristics as explanatory variables in our pay models. The model specifications and variables used in the analysis are discussed herewith.

6.3.1 Model specifications

6.3.1.1 Employer size

There is strong evidence in the empirical literature in favour of a significant and positive relationship between wages and employer size – what is commonly known as the employer size-wage effect[51]. Accordingly, first, we regress the log of average monthly pay per worker on two dummies for employer size categories without controls as follows:

$$lavpay_i = \beta_0 + \beta_1 medium_i + \beta_2 large_i + \varepsilon_{1i} \qquad 6.15$$

where

$lavpay_i$: log average monthly pay per worker.

$medium_i$: medium-size firms (50 to 150 employees).

$large_i$: large-size firms (more than 150 employees).

ε_{1i} : error term.

And the *i* subscript represents an individual firm. Employees in large firms earn more because they are more productive (Idson & Oi, 1999). We use the reliable proxy for employer size in the Malaysian FLD, which is the total number of employees in the

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[51] For example, Brown and Medoff (1989); Brown et al. (1990); Oi and Idson (1999).

firm. We construct employer size dummies, namely *$large_i$* firms with more than 150 workers, *$medium_i$* firms with a total number of workers between 50 and 150, and small firms with less than 50 workers (as reference). We expect that if the market is perfectly competitive, we should find $\beta_1 and \beta_2 = 0$. But usually, one finds that $\beta_1 and \beta_2 = 0$ is rejected in favour of $\beta_1 and \beta_2 > 0$.

6.3.1.2 Firms' human capital

The above model does not control for human capital variables. Thus, in the next step we include a set of the firms' human capital variables (i.e. share of skilled workers, share of female workers, share of higher education workers, and share of foreign workers) to control for differences in worker quality among firms, as follows:

$$\begin{aligned} lavpay_i = {} & \beta_0 + \beta_1 medium_i + \beta_2 large_i + \beta_3 sskl_i + \beta_4 sfem_i + \beta_5 suniv_i \\ & + \beta_6 sfor_i + \varepsilon_{2i} \end{aligned} \qquad \textbf{6.16}$$

where,

$sskl_i$: share of skilled workers (%).

$sfem_i$: share of female workers (%).

$suniv_i$: share of higher education workers (%).

$sfor_i$: share of foreign workers (%).

ε_{2i} : error term.

And the rest of the variables and parameter symbols are defined as in equation 6.7. However, Brown and Medoff (1989), Troske (1997), Mazumdar (1983) and Valenchik (1997) have argued that there is strong evidence that $\beta_1 and \beta_2 > 0$, even when differences in human capital are taken into account in both developed and developing countries.

We incorporated the composition skills of labour within each firm, which are represented by the share of skilled labour ($sskl_i$). Skilled labour is the sum of permanent management[52], professionals[53], skilled production workers[54], and non-production workers[55]. The share of skilled labour is the percentage of skilled labour in terms of total employment[56]. In addition, we also include the composition of worker qualification variables, which is represented by the share of labour with some university or higher level of education ($suniv_i$). We believe that these two variables are important based on the idea that both average educational level and skills in the firm are likely to be positively correlated with wages (Lucas, 1988).

We also control for the gender composition of the workforce within each firm in terms of the share of female workers ($sfem_i$) in the firm, since this has been shown to have a negative effect on worker's pay (Croson and Gneezy, 2009). This variable is defined as the percentage of total permanent female workers in terms of total employment. Moreover, the share of foreign workers (*sfor*) within each firm is included as suggested by Athukorala (2011), since foreign labourers have a statistically significant negative

[52] Management refers to persons making management decisions, and exclude supervisors.
[53] Professionals refer to trained and certified specialists outside management such as engineers, accountants, lawyers, chemists, scientists, and software programmers. Generally, professionals hold a university-level degree.
[54] Skilled production workers are technicians involved directly in the production process or at a supervisory level and whom management considers to be skilled.
[55] Non-production workers refer to support, administrative, sales workers not included in management or among professionals.
[56] Total employment is the total number of permanent workers, not including temporary workers.

impact on wages in Malaysian manufacturing. Accordingly, we expect $\beta_3 and \beta_5$ to have a positive sign, while $\beta_4 and \beta_6$ should have a negative sign.

6.3.1.3 Firm's performance

Studies on pay that utilized data with workplace characteristics have been able to explain 60 to 80 percent of the pay variations (Abowd and Killingsworth, 1983).Workplace characteristics, which can be expected to influence average worker's pay, include firm's performance, ownership, legal-status, market-orientation, firm age, types of work shift, union density, technological innovation, type of activity, and firm location. Accordingly, we add those employer characteristics variables to explain the average firm-level pay determinants, as follows:

$$\begin{aligned} lavpay_i = {} & \beta_0 + \beta_1 medium_i + \beta_2 large_i + \beta_3 sskl_i + \beta_4 sfem_i + \beta_5 suniv_i \\ & + \beta_6 sfor_i + \beta_7 lval_i + \beta_8 lclr_i + \beta_9 lpft_i + \beta_{10} fown_i + \beta_{11} uni_i \\ & + \beta_{12} ptn_i + \beta_{13} prlc_i + \beta_{14} pblc_i + \beta_{15} pbcn_i + \beta_{16} coop_i \\ & + \beta_{17} fage_i + \beta_{18} tech_i + \beta_{19} exp_i + \beta_{20} dshf_i + \beta_{21} tshf_i + \varepsilon_{3i} \end{aligned} \qquad \textbf{6.17}$$

where,

$lval_i$: productivity (log of value added per worker)

$lclr_i$: capital stock (log of capital labour ratio)

$lpft_i$: profitability (log of profit per worker)

$fown_i$: dummy of foreign ownership

uni_i : dummy of union density

ptn_i : dummy of partnership legal status

$prlc_i$: dummy of private limited company legal status

$pblc_i$: dummy of public limited company legal status

$pbcn_i$: dummy of public corporation legal status

$coop_i$: dummy of cooperative legal status

$fage_i$: firm's age

$tech_i$: technological innovation

exp_i : dummy of export orientation

$dshf_i$: dummy of double shifts

$tshf_i$: dummy of triple shifts

ε_{3i} : error term

and the rest of the variables and parameter symbols are defined as in equation 6.8.

Firm performance is based on two variables: firstly, firm productivity (i.e. *lval*) measured by the ratio of value-added to total employment. Value-added is defined as output (i.e. total sales) minus the intermediate cost[57]. Secondly, firm profitability (i.e. *lpft*), which is represented by profit per worker measure as the ratio of operating revenue to total employment. This measure avoids managerial and accounting discretion and best captures the employer's ability to pay. We expect β_7 and β_9 to have

[57] Intermediate costs are defined as the sum of direct material cost, electricity expenditures and fuel, and other energy expenditures.

a positive sign. This is because firms with greater productivity and greater ability to pay are able to pay higher wages.

6.3.1.4 Firm's input

In addition, we also include a firm input variable, namely log of capital labour ratio ($lclr_i$)[58], to capture how the average worker's pay is affected by the capital stock. Capital labour ratio is calculated as the net book value of machinery and equipment divided by total employment. We expect β_8 to have a positive sign.

6.3.1.5 Firm's ownership and legal status

On average, foreign firms in all countries appear to pay higher wages than domestic firms (Lipsey & Sjoholm, 2001). To account for this, the dummy variable, $fown_i$, is introduced where the value of one indicates that less or more than 30 percent of the firm is foreign-owned, with domestically owned as reference group. A firm's legal-status is represented by five categories: partnership[59] (ptn_i), private limited company[60]

[58] More exactly, the logarithm of total employment and capital of the firm proves to be more adequate than their identity (i.e. level).
[59] A partnership refers to a group of individuals who agree to contract and carry on a business with the objective of making a profit. Generally, a business partnership must comprise at least 2 members and should not exceed 20 members.
[60] A private limited company refers to a private corporation established to undertake a business with the objective of making profit, with a minimum of two and maximum of 50 members. The shareholders control business operations and are restricted to transferring their shares.

($prlc_i$), public limited company[61] ($pblc_i$), public corporation[62] ($pbcn_i$), and co-operative[63] ($coop_i$), with individual proprietorship[64] as reference group.

6.3.1.6 Type of work shifts

The type of work shift is measured by two categories of dummies, i.e. double shift ($dshf_i$) and triple shift ($tshf_i$), with single shift as reference group. We expect β_{20} and β_{21} to have a positive sign.

6.3.1.7 Export orientation

Market orientation variable refers to exporter (exp_i), i.e. the firm which exports more than 10 percent of its sales, with non-exporter as reference group. We expect β_{19} to have a positive sign.

6.3.1.8 Union density

The firm's union density is represented by union dummy (uni_i), i.e. a firm in which more than 10 percent of its workers are union members, with others as reference. We expect β_{11} to have a positive sign.

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[61] A public limited company refers to a private corporation established with limited liability by a minimum of 2 members to operate a business with the objective of making a profit. The shares are openly held, and in the case of a company listed on the stock exchange, the shares are freely transferable.
[62] A public corporation refers to an undertaking set up under a Special Act of Parliament or by the State Legislature.
[63] A co-operative refers to a voluntary association with unrestricted members and registered under the Co-operative Act 1993. Funds are collectively owned to meet the needs of members.
[64] An individual proprietorship refers to a business, operated and owned by one person for his own profit.

6.3.1.9 Firm's age

Firm's age (*$fage_i$*) refers to the number of years a firm has been operating. We expect β_{17} to have a positive sign.

6.3.1.10 Technological innovation

Technological innovation (*tech*) is measured by the percentage of firm machinery that is less than 5 years old. We expect β_{18} to have a positive sign.

6.3.1.11 Regional and industrial variation

Finally, equation 6.9 can be further improved by including five regional dummies (namely North, South, East Coast, Sabah, and Sarawak)[65] and nine industrial dummies based on four digit ISIC for manufacturing firms (i.e. garments, chemicals, rubber and plastics, machinery and equipment, electric appliances, electronics, automobile parts, wood and furniture, and food processing)[66] to control for firms' geographical and sectoral location, as follows:

$$\begin{aligned} lavpay_i = {} & \beta_0 + \beta_1 medium_i + \beta_2 large_i + \beta_3 sskl_i + \beta_4 sfem_i \\ & + \beta_5 suniv_i + \beta_6 sfor_i + \beta_7 lval_i + \beta_8 lclr_i + \beta_9 lpft_i \\ & + \beta_{10} fown_i + \beta_{11} uni_i + \beta_{12} ptn_i + \beta_{13} prlc_i + \beta_{14} pblc_i \\ & + \beta_{15} pbcn_i + \beta_{16} coop_i + \beta_{17} fage_i + \beta_{18} tech_i + \beta_{19} exp_i \\ & + \beta_{20} dshf_i + \beta_{21} tshf_i + \beta_{22} nrt_i + \beta_{23} sth_i + \beta_{24} east_i \\ & + \beta_{25} sbh_i + \beta_{26} swk + \beta_{27} grm_i + \beta_{28} chm_i + \beta_{29} rp_i \\ & + \beta_{30} me_i + \beta_{31} ea_i + \beta_{32} elec_i + \beta_{33} auto_i \\ & + \beta_{34} wf_i + \beta_{35} txl_i + \varepsilon_{4i} \end{aligned} \tag{6.18}$$

[65] The Central region as reference group.
[66] The food processing industry as reference group.

where,

nrt_i : dummy of north region.

sth_i : dummy of south region.

$east_i$: dummy of east coast.

sbh_i : dummy of Sabah.

swk_i : dummy of Sarawak.

grm_i : dummy of garments industry.

chm_i : dummy of chemicals industry.

rp_i : dummy of rubber and plastics industry.

me_i : dummy of machinery and equipment industry.

ea_i : dummy of electric appliances industry.

$elec_i$: dummy of electronics industry.

$auto_i$: dummy of automobile parts industry.

wf_i : dummy of wood and furniture industry.

txl_i : dummy of textile industry.

ε_{4i} : error term.

And the rest of the variables and parameter symbols are defined as in equation 6.9.

In fact, there are studies that argued for the workers' pay being influenced by the location of the firm. For example, Schafgans (2000) pointed out that employees in urban areas in Malaysia earned higher pay than those who work in rural areas. Meanwhile, Fally et al. (2010), Hering & Poncet (2010), and Ma (2006) claimed that there exists a positive and strong correlation between supplier access and market access on the one hand and workers' pay on the other, as was the case in Brazil and China. In the case of Malaysia, firms that are located in urban areas, particularly in the Central region, possess good supplier access and market access compared to other regions such as north, south, east coast, Sabah and Sarawak. We expect all five region dummies to have negative signs because we believe that the average firm-level pay rates in those regions are less than that of the Central region (i.e. Klang Valley)[67]. Pay differences exist across industries owing to unmeasured differences in the productive endowments of employees (Gibbons & Katz, 1992). Therefore, we expect the industry dummies to have positive or negative signs.

6.3.2 The estimation strategy

All regression models are estimated using OLS with robust standard errors to address heteroscedasticity. Before running the regression, I first checked for the correlation between independent variables through VIF (Variance Inflation Factor), and found no signs of high multicollinearity. VIF values for most of the variables are around 1 and 2, and the tolerance (1/VIF) value is higher than 0.2 for all the independent variables[68]. As a rule of thumb, if the VIF value is greater than 10 or tolerance is lower than 0.1, then multicollinearity is a problem.

[67] Klang Valley is Malaysia's most developed region. Moreover, the cost of living in Klang Valley is higher than other regions stated above.
[68] Refer to Table 6.4 in the appendix to this chapter.

Estimating the equations using Malaysia's WLD, which was obtained from Malaysia's PICS 2007 by OLS, requires that the hierarchical character of the data I am dealing with is neglected (where workers are grouped into larger units, i.e. workplaces). As pointed out by Wooden and Bora (1999), individuals from the same workplace have to some extent similar characteristics when compared with those from other workplaces. Given the fact that not all these characteristics can be measured empirically, it follows that the disturbances might be correlated. In this case, the assumption of independence is violated.

For the estimation, we initially run OLS regression of the log average monthly pay per worker on two dummies associated with each firm size categories[69], and then add other employer characteristics variables to see how they affect the magnitude and significance of the coefficient on employer size. We estimate the determinants of average firm-level pay rates using four specifications of the Malaysian pay model that were discussed in Section 6.3.1.

In the next step, we regress the log average monthly pay per worker on the continuous employer size variable (i.e. log of employment) in order to obtain a summary measure of the effect of employer size on average firm-level pay rates, that is, the employer size-pay elasticity. In this respect, we only replace dummies of employer size with log of employment, while other specifications remain unchanged.

[69] Note that the categorization of employer size in the Malaysian FLD distinguishes firms with less than 50 employees as small, firms with over 150 employees as large, while medium-size is firms with employees between 50 and 149, which will be the omitted category in the regressions.

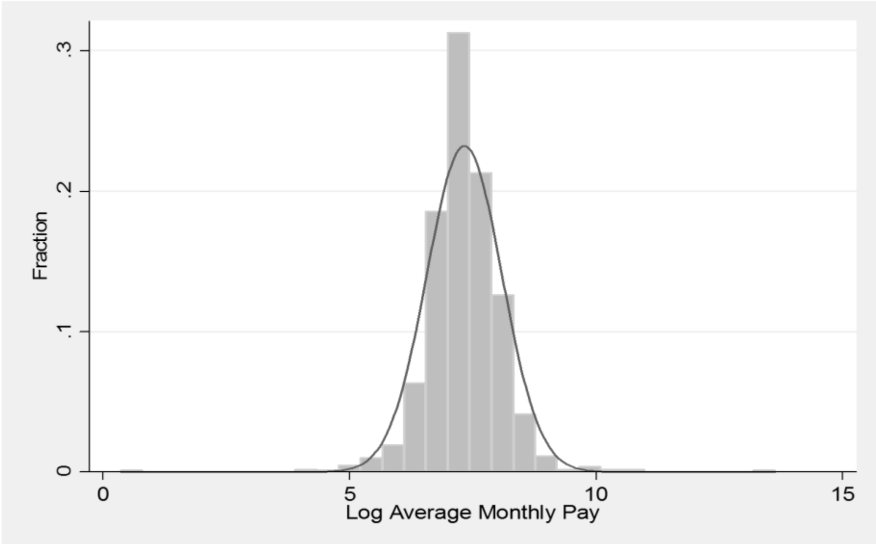
6.3.3 Descriptive statistics

6.3.3.1 Dependent variable

The summary descriptive statistics indicate that the average (mean) monthly pay per worker is RM 1,841.94, while the median (50th percentile) average monthly pay per worker is RM 1,502.56. This means that half of the workers earn less than RM 1,502.56 per month and half earn more. The mean monthly pay per worker is significantly higher than the median monthly pay per worker, and most workers earn less than the average. This is a characteristic of right skewed distributions.

The interquartile range (75th percentile – 25th percentile) is RM 2,339.27 – RM 1,072.08 = RM 1,267.19. Variability in pay is high: although the median pay is RM 1,502.56, the central half of the sample earns between RM 1,072.08 and RM 2,339.27. The interquartile range: the lowest quarter of the sample earns less than RM 1,072.08 while the top quarter earns more than RM 2,339.27. By all accounts, the average monthly pay per worker varies considerably. Using the logarithm of average monthly pay per worker produces a more symmetric, bell-shaped distribution, with the mean (7.35) and median (7.31) closer together, as shown in Figure 6.2.

Figure 6.3: Histogram of the log of average monthly pay



6.3.3.2 Explanatory variables

In this chapter, we utilise the Malaysian FLD in order to examine how the average monthly workers' pay is affected by employer characteristics. Table 6.1 depicts the value of mean key variables in the Malaysian FLD by firm size. In general, the average monthly pay per worker in the manufacturing sector is well over RM 1,800.00. When we break up the firms' size into small, medium and large firms, we find that large firms received the highest average of monthly pay per worker of RM 2,059.16. At the same time, small and medium firms occupied the second and third place, with an average monthly pay per worker of RM 1,795.56 and RM 1,691.71, respectively.

Table 6-1 : Mean and standard deviations by firm size (Malaysian FLD)

	All		Small (281firms)		Medium (227 firms)		Large (217 firms)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
avmpay	1841.94	1164.60	1795.56	1220.59	1691.71	977.01	2059.16	1241.83
lavmpay	7.35	0.58	7.31	0.60	7.28	0.55	7.48	0.55
small	0.39	0.49						
large	0.30	0.46						
sskl	49.28	28.15	53.47	28.01	46.47	27.11	46.78	28.86
sfem	33.04	25.09	31.76	25.15	31.58	24.02	36.22	25.91
suniv	16.38	16.42	13.97	17.28	15.45	13.41	20.48	17.41
sfor	23.95	25.25	17.86	23.30	28.35	25.12	27.25	26.33
lval	11.10	1.12	11.01	1.17	11.08	1.00	11.22	1.16
lclr	9.70	1.89	9.46	2.16	9.99	1.52	9.71	1.84
lpft	11.90	1.12	11.71	1.14	11.95	1.04	12.10	1.12
fown	0.05	0.22	0.04	0.19	0.05	0.22	0.07	0.25
uni	0.29	0.45	0.17	0.38	0.20	0.40	0.52	0.50
ptn	0.07	0.26	0.12	0.33	0.04	0.21	0.04	0.19
prlc	0.86	0.35	0.79	0.41	0.92	0.27	0.87	0.34
pblc	0.03	0.18	0.01	0.10	0.02	0.15	0.07	0.25
pbcn	0.00	0.06	0.01	0.10	0.00	0.07	0.01	0.10
coop	0.00	0.06	0.01	0.08	0.00	0.06	0.00	0.07
fage	18.18	9.75	18.16	10.43	18.12	9.40	18.29	9.24
tech	23.49	26.08	21.55	27.02	24.98	26.89	24.45	23.85
exp	0.54	0.50	0.31	0.46	0.57	0.50	0.79	0.41
dshf	0.28	0.45	0.19	0.39	0.33	0.47	0.35	0.48
tshf	0.21	0.41	0.07	0.25	0.22	0.42	0.39	0.49
nrt	0.23	0.42	0.18	0.39	0.25	0.43	0.27	0.44
sth	0.32	0.47	0.33	0.47	0.30	0.46	0.32	0.47
east	0.03	0.17	0.04	0.20	0.02	0.15	0.02	0.15
Sbh	0.04	0.19	0.05	0.23	0.04	0.18	0.02	0.15
Swk	0.05	0.22	0.10	0.30	0.03	0.17	0.01	0.12
Grm	0.04	0.20	0.05	0.21	0.04	0.18	0.04	0.19
Chm	0.06	0.24	0.08	0.27	0.04	0.20	0.06	0.25
Rp	0.08	0.26	0.07	0.26	0.07	0.25	0.09	0.29
Me	0.24	0.42	0.21	0.41	0.28	0.45	0.22	0.41
Ea	0.09	0.29	0.12	0.33	0.07	0.26	0.07	0.25
Elec	0.03	0.18	0.01	0.12	0.03	0.17	0.06	0.23
Auto	0.08	0.27	0.02	0.13	0.06	0.23	0.18	0.38
Wf	0.03	0.18	0.02	0.14	0.04	0.18	0.05	0.22
Txl	0.11	0.32	0.12	0.33	0.14	0.34	0.08	0.28

Source: Calculated by the author using Malaysian FLD obtained from Malaysia's PICS-2.

In addition, Table 6.1 indicates that 49 percent of workers in manufacturing are skilled workers comprising management, professionals, skilled production workers, and non-production workers. Specifically, the majority of skilled workers work in small firms (about 53 percent), while around 46 percent work in medium and large firms. In contrast, most higher educated workers work in large firms (20 percent), followed by medium firms (15 percent), and then small firms (13 percent). Meanwhile, the share of female workers is higher in large firms at around 36 percent. This is followed by small and medium firms at around 32 percent each. On average, some 24 percent of foreign workers work in manufacturing firms in Malaysia. Most foreign workers work in medium and large firms. In each medium-size firm, 28 percent are foreign workers, while in each large firm about 27 percent are foreign workers. With respect to firms' age, the majority of firms in our sample have been doing business for around 18 years.

6.4 Empirical results

6.4.1 The effects of employer characteristics on the average pay rates

This section presents the results of a cross-sectional OLS estimation of the average firm-level pay rates determination in the Malaysian manufacturing sector. The unit of analysis is a firm. Table 6.2 presents the OLS estimates on determinants of average firm-level pay rates based on two employer-size dummies, i.e. medium and large, with small firm acting as reference category, as presented in equations 6.7 – 6.10. Model 1 includes only employer size dummies; while in model 2 (apart from employer-size dummies), we also include the firm's human capital variables. In model 3, we add other employer characteristics, while regional and industrial variations are included in model 4. The aim of this analysis is to examine the effect of employer characteristics on the average monthly pay per worker.

First, we note that employer size wage premium is positively significant, which is in line with the finding in previous studies that pay tends to increase with employer size (Idson and Oi, 1999; Soderbom et al., 2005). Based on model 1 in Table 6.2, the coefficient associated with the dummy for medium and large firms gives an average firm-level pay rates differential of 0.037 and 0.194, respectively. In terms of percentage, the pay premiums in medium and large firms are 3.8 percent and 21.4 percent respectively[70] over small firms.

Model 2 of Table 6.2 reports estimation results of the pay model, where the human capital variables are included as explanatory to control for differences in workers' quality. The inclusion of the firm's human capital has led to the coefficient of dummy for medium and large firms being reduced slightly compared to model 1. This shows that part of the employer size pay gap can be explained by the firm's human capital (namely, percentage of skilled workers, percentage of female workers, percentage of higher education workers, and percentage of foreign workers) differences across firm. The average monthly pay per worker for medium and large firms is 2.6 percent and 16.5 percent more than that for small firms, respectively.

[70] This percentage corresponds to the anti-log of the regression coefficient minus one.

In addition, we found that all the firm's human capital variables played a significant role in determining the average firm-level pay rates. The coefficients of $sskl_{i,}$ $sfem_i$, $suniv_{i,}$ and $sfor_i$ are statistically and highly significant with the expected signs (refer to model 2 in Table 6.2). Shares of both skilled and higher education workers positively affect the average workers' pay. When $sskl_i$ and $suniv_i$ increase by 1 percent, the average workers' pay increases by 0.42 percent and 0.9 percent, respectively. In contrast, shares of both female and foreign workers in the firm negatively affect the average workers' pay. When $sfem_i$ and $sfor_i$ increase by 1 percent, the average monthly pay per worker will decrease by 0.25 percent and 0.4 percent, respectively.

Meanwhile, the third model in Table 6.2 reports estimation results for the average pay per worker which combine both human capital variables with workplace characteristics. Introducing the effects of firm performance, firm input, ownership, type of work shifts, export orientation, union density, firm's age, and technological innovation (in model 3) does not change the employer size gap for medium firms, whereas the gap is substantially reduced for large firms (0.12). In other words, the average pay premium in large firms decreases to 12.4 percent (in model 3) from 16.5 percent (in model 2). This implies that some of the employer size pay gap can be explained by the firm's characteristics, as included in model 3.

Apart from employer size, employer characteristics such as firm's productivity, firm's performance, firm's input, and foreign ownership all played an important role in determining the average monthly pay per worker. Based on model 3 in Table 6.2, the coefficients of $lval_i$, $lpft_i$, $lclr_i$, and $fown_i$ are statistically and highly significant with a positive sign. This indicates that firms with higher productivity, higher ability to pay, and high capital intensity tend to pay higher wages.

The estimated coefficients for $lval_{i}$, $lpft_{i}$ and $lclr_{i}$ are 0.07, 0.13 and 0.02, respectively. This means that an increase by 1 percent in productivity, profitability, and capital labour ratio will lead to increases of 7 percent, 13 percent, and 2 percent in the average worker's pay rates, respectively. Likewise, as suggested by Lipsey and Sjoholm (2001), foreign-owned firms do pay higher wages than domestically owned ones. Foreign-owned firms offer a pay premium of 0.096 log points or around 10 percent over domestic firms. Meanwhile, results in model 3 also found that variables such as trade union, legal status, firm's age, technological innovation, exporter, and types of work shift are insignificant.

In order to control for firms' geographical and sectoral location, the regional and industrial dummies are taken into account in model 4 of Table 6.2. In both cases, the central region and food processing industry serve as reference categories. The inclusion of regional and industrial variation reduces the employer-size pay premium for medium and large firms. In addition, the effects of the firm's human capital variables as well as other employer characteristics are somewhat consistent with results from model 3, even though regional and industrial effects are included in the model.

Based on model 4 of Table 6.2, we also pointed out that the firm's location is important in determining the average firm-level pay rates in Malaysia, since all regional dummies are statistically significant with an anticipated negative sign. These results seem to suggest that the average monthly pay per worker in the central region is greater than in other regions. Those results also indicate that the second highest average firm-level pay rates goes to the south region, and the third highest to the north region. This is followed by Sabah, Sarawak, and the east coast. In terms of industry, the results show that only rubber & plastic, machinery & equipment and auto parts industries remain positive and statistically significant at least at the 5 percent level. This implies that workers in those industries enjoy higher pay compared to those in the food processing industry. The results also indicate that among the three industries, firms in machinery & equipment industry have the highest average pay rates. This is followed by auto parts and rubber & plastics industries.

Table 6-2: Determinants of average firm-level pay rates by the OLS with robust SE

Explanatory Variables	Dependent variable: log of average monthly pay per worker (RM)			
	Model 1	Model 2	Model 3	Model 4
medium	0.037***	0.025**	0.024**	0.022**
large	0.194***	0.153**	0.117**	0.100**
sskl		0.004***	0.003***	.00254***
sfem		-0.003**	-0.002**	-0.001**
suniv		0.009***	0.005***	0.005***
sfor		-0.004***	-0.003***	-0.003***
lval			0.073**	0.060**
lclr			0.021**	0.020**
lpft			0.131***	0.140***
fown			0.096*	0.090*
uni			0.060	0.030
ptn			0.150	0.120
prlc			0.041	0.022
pblc			0.170	0.130
pbcn			-0.260	-0.31
coop			-0.574***	-0.515**
fage			0.001	0.001
tech			0.000	0.001
exp			0.020	0.001
dshf			0.001	-0.01
tshf			0.001	0.01
nrt				-0.170**
sth				-0.051**
east				-0.320**
sbh				-0.260**
swk				-0.302**
grm				0.030
chm				0.101
rp				0.136**
me				0.243**
ea				0.201
elect				0.062
auto				0.182**
wf				0.120
txl				0.080
_cons	7.28***	7.15***	4.51***	4.59***
Observations	725	725	725	725
Adjusted R2	0.018	0.226	0.375	0.396
R-squared	0.021	0.232	0.393	0.425

Notes: Small, sole proprietorships status, single shifts, central region, and food & processing industry are the reference categories. Significance at the 1 percent, 5 percent and 10 percent level is indicated by ***, ** and * respectively.

6.4.2 The elasticity of the average pay rates with respect to employer size

Table 6.3 gives the results of estimation of average monthly pay per worker on the employer size pay elasticity by taking employer size as a continuous variable, i.e. log of employment (*lemp*$_i$). In fact, this variable replaces the dummy of employer size, as indicated in equations 6.7- 6.10. Meanwhile, the specifications of models 1-4 are the same as in Table 6.2. This analysis will enable us to examine the magnitude of the employer size pay effect on the worker's pay by estimating the elasticity of labour supply curve facing the firm, which has been discussed in the theoretical framework in Section 6.2.

Based on model 1 in Table 6.3, and in the absence of any control variables, the coefficient on employer size (which is proxy by log of employment) is positive and highly significant. This indicates that the elasticity of average firm-level pay rates with respect to employer size is approximately 5 percent. When the firm's human capital variables are included in model 2, the size of the coefficients associated with employer size increases slightly to 0.045. The results also show that the firm's human capital variables are statistically and highly significant with expected signs. Moreover, the magnitude of their coefficients for each variable is somewhat consistent with the results in model 2 of Table 6.2.

Consequently, the inclusion in model 3 of other employer characteristics variables (i.e. firm's performance, firm's input, ownership, type of work shifts, export orientation, union density, firm's age, and technological innovation) substantially reduces the effect of employer size, leaving an estimated pay differential of 2 percent. Meanwhile, with the inclusion of regional and industrial variables in model 4, the results show that the employer size effects on average worker's pay remain unchanged. In addition, the results also show that the effects of employer characteristics on the average worker's pay are somewhat consistent with results in models 3 and 4 in Table 6.2.

Table 6-3: The elasticity of average firm-level pay rates with respect to employer size estimated by the OLS with robust standard errors

Explanatory variables	Dependent variable: log of average monthly pay per worker (RM)			
	Model 1	Model 2	Model 3	Model 4
lemp	0.047**	0.045***	0.023**	0.020**
sskl		0.004***	0.003***	.00254***
sfem		-0.003**	-0.001**	-0.0009
suniv		0.009***	0.005***	.00482***
sfor		-0.004***	-0.003***	-.00286***
lval			0.075**	.0614*
lclr			0.019	0.0185
lpft			0.130***	0.139***
fown			-0.088	-0.088
uni			0.071	0.035
ptn			0.150	0.111
prlc			0.028	0.012
pblc			0.171	0.126
pbcn			-0.252	-0.309
coop			-0.564***	-.0507**
fage			0.001	0.002
tech			-0.001	-0.001
exp			0.023	-0.005
dshf			-0.004	-0.010
tshf			0.002	0.010
nrt				-0.102**
sth				-0.040**
east				-0.105**
sbh				-0.153**
swk				-0.113*
grm				0.037
chm				0.103
rp				0.140*
me				0.201
ea				0.249***
elect				-0.059
auto				0.188*
wf				0.125
txl				-0.080
_cons	7.15***	6.93***	4.48***	4.56***
Observations	725	725	725	725
Adjusted R2	0.00946	0.223	0.372	0.394
R-squared	0.0108	0.229	0.389	0.422

Notes: Sole proprietorships status, single shifts, central region, and food & processing industry are the reference categories. Significance at the 1 percent, 5 percent and 10 percent level is indicated by ***, ** and * respectively.

6.5 Conclusions

This chapter tried to explore the factors that determine the average pay rates in the Malaysian economy from the employer's perspective using firm-level data. Using the Malaysian FLD that was obtained from Malaysia's PICS-2, we estimate the relationship between employer characteristics (particularly the employer size) and the average firm level pay rates. Through this study, we tried to fill the gap in the literature on pay determinants at the firm level, with special reference to the case of Malaysia. In this chapter, we first explore the effect of employer characteristics on the average firm-level pay rates. Afterwards, we then examine the elasticity of average firm-level pay rates with respect to the employer size so as to provide some evidence of imperfect competition in the Malaysian labour market.

The regression results provide evidence, in line with the observations of Idson and Oi (1999) and Soderbom and Teal (2004), that larger employers pay higher wages than smaller employers. Medium firms (between 50 and 150 employees) and large firms (more than 150 employees) pay higher wages compared to small firms, even after controlling for the firms' human capital and employer characteristics including regional and industrial variation. The elasticity of pay with respect to employer size (proxy by log of employment) is 0.0496 in the absence of any controls. Despite controlling for a large array of firms' human capital and other employer characteristics including locations and industry factors, the elasticity of average firm-level pay rates with respect to employer size still exists at around 0.0205. Therefore, there seems to be strong evidence for characterising the labour market in Malaysia as one with a monopsonistic market structure where firms with bigger market share also have a higher mark-up on their pay.

Similarly, the share of skilled and higher education workers in the firm is positively correlated with the average monthly pay per worker as expected, whereas the share of female and foreign workers has a negative association. The latter could either be an indication that female workers are less productive or those female workers are employed in less productive firms.

Apart from employer size and the firm's human capital, firm's productivity, firm's profitability, capital, foreign-owned, regional and industry variations also played an important role in determining the average firm-level pay rates. From the findings, we can also conclude that the firm's profitability and employer size are the key to determining the average firm-level pay rates in Malaysian manufacturing. In this respect, one can say that the Malaysian labour market supports the theory of monopsony and rent sharing, whereas in a less competitive market, the employer may be able to share higher rents (profits) with employees, and by definition market power varies positively with the size of the employer (Arkelof and Yellen, 1990).

Annex Chapter 6

Table 6-4: VIF test for multicollinearity problem

Variable	VIF	1/VIF
prlc	4.67	0.21
lpft	4.29	0.23
lval	3.52	0.28
ptn	3.35	0.30
pblc	2.19	0.46
ea	1.89	0.53
tshf	1.74	0.57
medium	1.73	0.58
txl	1.72	0.58
large	1.67	0.60
auto	1.61	0.62
sth	1.60	0.63
rp	1.55	0.64
elect	1.53	0.65
dshf	1.53	0.66
uni	1.48	0.68
nrt	1.43	0.70
exp	1.43	0.70
sfem	1.40	0.72
sfor	1.39	0.72
me	1.38	0.72
swk	1.34	0.75
suniv	1.33	0.75
east	1.33	0.75
lclr	1.30	0.77
chm	1.27	0.78
sskl	1.26	0.80
coop	1.25	0.80
wf	1.24	0.81
elect	1.23	0.81
pbcn	1.21	0.83
fage	1.21	0.83
Sbh	1.19	0.84
fown	1.11	0.90
tech	1.10	0.91
Mean VIF	1.73	

CHAPTER 7 : THE ROLE OF EMPLOYER-EMPLOYEE SPECIFIC EFFECTS IN DETERMINING THE INDIVIDUAL WORKER'S PAY

7.1 Introduction

To date, most of the empirical studies on pay determination in Malaysia have had to rely on individual-level data alone. In addition, few studies on developing countries, particularly Malaysia, have been able to direct the attention to the potentially important role in wage determination that is played by the firm or employer characteristics. In addition, studies in this area have rarely used data on workers that matched those of their employers. This is an important omission because recent advances in economic analysis of the labour market elsewhere have found that estimates derived from matched employee-employer data (e.g. on returns on education) are often substantially different from findings based on a more restricted dataset.

In Chapters 5 and 6 of this thesis, we have analysed the determinants of pay at the worker- and firm-level. Analysis in Chapter 5 uses only workers' information, while analysis in Chapter 6 uses firms' information, with limited information on individual workers. As a complementary to both analyses, this chapter is aimed at examining the role played by both worker and employer characteristics in determining the worker's pay in the Malaysian economy. To perform this task, we utilise a cross-sectional Malaysian MWFD from the Malaysian manufacturing sector in 2006. To my knowledge, this study is the first empirical analysis of pay determination that includes employer-employee specific effects from within the Malaysian economy. Specifically, the aims of this chapter are to examine first of all the roles of worker and firm characteristics in determining pay in the Malaysian economy; secondly, it will also examine the worker characteristics' net effects on pay; and thirdly, the role of employer-specific pay policies in the pay formation process.

This chapter is organised as follows. Section 7.2 discusses the importance of the matched worker-firm dataset. Section 7.3 provides the theoretical motivation for this empirical study. Section 7.4 provides a description of data and variables used. Section 7.5 discusses the methodology and estimation strategy. Section 7.6 discusses the empirical results before drawing some conclusions.

7.2 The importance of matched employer-employee dataset

Wage rates, productivity and profitability are labour market outcomes driven by the interactions between two parties, i.e. employers and employees. It is crucial and timely to understand these interactions in light of the dramatic changes in the international economy over the past several decades (Haltiwanger *et al.*, 2007). For example, if there are changes in technology or job restructuring at the firm level, these changes also affect employees in those firms. Consequently, any policies ought to be driven by a certain understanding of their repercussions. Theoretically, the determination of wage rates by employers is based on the demand-side (i.e. employees' characteristics) and supply-side (i.e. employers' characteristics) of the labour market. Empirically, the strength of each factor can only be assessed if the observed characteristics of employers and employees are simultaneously captured, as well as allowing for the unobserved person and firm effects within the regression equation that explains the determination of wage.

Until recently, most econometric analyses of wage determination were based on datasets that had only the supply-side (i.e. worker- or household-level) or demand-side (i.e. firm-level). Therefore, the understanding of the interactions between employers and workers has been limited, as these data sources contain information from only one side of the market, let alone being incapable of analysing models that incorporate both aspects of supply and demand. In recent years, data that combine employees' characteristics and specifications of the firms they work in – i.e. matched employer-employee datasets (MEED) – have become increasingly available. These datasets therefore combine the observations on typical firm-level variables (e.g. value added, and factor employment) with socio-demographic data (e.g. employees' age, job tenure, ethnic origin, gender, experience, skill, and pay). MEED has led to an explosion of interest in research on the outcomes of labour market interactions between firms and their employees. As explained in Abowd and Kramarz (1998), there are generally two types of MEED, i.e. cross-sectional and longitudinal. Cross-sectional MEED is based on surveys of firms and their workers via face-to-face interviews with human resource managers and workers. On the other hand, longitudinal MEED is based on administrative data which track firms and their workers over time. Although cross-sectional data contain a smaller number of observations than longitudinal data, they are richer in covariates.

Why is the creation and availability of MEED important? This is due to their potential advantages over other data. Generally, there are four advantages of these data (Bryson and Forth, 2006). Firstly, it can provide a full understanding of the dynamics and interactions between employers and their employees in the labour market. This is because the data provide information about workers' specific characteristics which match up with the specific characteristics of their workplace. Secondly, it can provide a thorough analysis based on unobserved information from both sides (i.e. employer and employee) and is able to overcome some of the biases inherent in data that rely solely on firms or workers. Thirdly, this data allow for the analyses of relative contributions to the wage distribution and other labour market features that are attributable to intra- and inter-firm dispersion as it involves multiple observations of workers within multiple firms. Fourthly, longitudinal MEED can tackle employer and employee selection processes as well as the antecedents and consequences of practice or worker adoption, thus permitting a more rigorous assessment of causal processes than might not otherwise be the case.

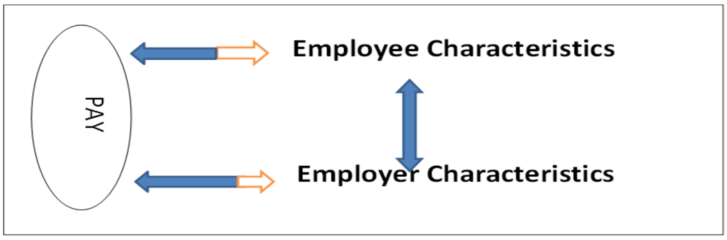
7.3 The importance of employer-employee specific effects on pay determinants

Workers with similar capacity would not be paid differently if the law of one price were to hold in the labour market. But why do such workers get different wages and why do similar firms pay different wages? This important question has motivated numerous studies that attempt to isolate the causes of wage heterogeneity as well as identifying significant market factors that are statistically related to wages (see, for example, Becker, 1993; Murphy and Welch, 1992).

There are three groups of studies that tried to explain the causes of wage heterogeneity. One of them suggested that wage heterogeneity is related to permanent unmeasured differences among individual workers, otherwise known as ‘a person fixed effect’. Another group had focused on the extent to which wage heterogeneity is related to permanent differences among employers, or ‘a firm fixed effect’. Still, a third or recent group of studies suggested that wage heterogeneity is related to both person and firm fixed effects. Along with the availability of MWFD[71], the appropriate econometric techniques to estimate firm and worker fixed effects in wage equation, as well as the computing facilities, are clearly needed in order to provide a proper understanding of pay determinant and its structure.

Abowd, Kramarz, and Morgalis (1999, henceforth AKM) combined these three elements to focus on wage determination with unobserved heterogeneity. They proposed distinguishing between *“employer effects”* which stem from firms’ characteristics, and *“employee effects”* due to workers’ characteristics. As can be seen in Figure 7.1, distinguishing between the two effects and capturing the net contribution of each one on pay can be rather complicated due to the way these effects are transmitted. Clearly, both the specification of the regression equation and the estimation method used will have to be carefully considered for estimates to be robust.

Figure 7.1: Conditions Requiring MEED



[71] See Abowd and Kramarz (1999) for descriptions of the matched employer-employee datasets that are currently available.

AKM was the first to focus on wage determination with unobserved heterogeneity. They proposed an empirical framework for estimating individual and firm effects on wage equation using a French longitudinal matched employer-employee dataset. This type of data enables them to estimate the relationship among various wage policies and firm-level economic variables.

By means of the Malaysian MWFD, we are able to control for both observed and unobserved heterogeneity among workers and their employer-firms. However, with a single-year MWFD, we are unable to separately identify and estimate worker fixed effects (the effects that are due to unobservable worker heterogeneity) and firm fixed effects (the effects that are due to firm heterogeneity). We can only estimate the cluster fixed effects (the effects that are due to the sum of employer fixed effects and the mean value of the worker's fixed effects for each firm).

7.4 Data description and variables

7.4.1 Malaysian matched worker-firm dataset (MWFD)

This chapter utilises a unique Malaysian MWFD[72] for one common year (2006), which allows for a more in-depth analysis of worker- and firm-specific effects on wages. The dataset contains a random sample of 7,059 full-time permanent workers employed in 752 Malaysian manufacturing firms in 2006. It provides information on workers' monthly salaries and other characteristics of both workers and firms.

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[72] This has been discussed in detail in Chapter 4.

7.4.2 Employee-level variables

The dependent variable in our analysis is the natural logarithm of monthly pay for employees in 2006. The monthly pay is defined as the sum of monthly salary, including all allowances and bonuses before tax. The effect of education on wages was measured by two different variables; first, by a continuous measure of the completed years of schooling and second, by the highest level of formal education attained. Nevertheless, the individual's years of education will be biased estimates of their true effects because some individuals do not earn degrees, while others do not complete their degrees within a standard number of years (Jagear and Page, 1996). Therefore, our dataset has information on both years of education and the highest level of formal education attained, allowing us to improve on earlier estimates. We use five dummies for the highest level of the worker's formal education, namely degree, diploma as a reference group, upper secondary, lower secondary, and primary plus informal education, as well as illiterate – all as direct estimates of the effects of academic credentials on wages.

Due to the absence of data on experience, Mincer (1974) proposed the alternative of "potential experience", i.e. the number of years an individual could have worked after completing schooling. Assuming that he/she starts schooling at 6 years old and begins working immediately after having completed schooling, the potential experience is equal to age – completed years of schooling – 6. In addition to education and experience, we also control for tenure, distance from job in kilometres, gender with male as reference group, marital status with single as reference group, types of occupation (i.e. management, professionals, skilled-worker, with unskilled worker as reference group), formal training received at the current employer, formal training received at the previous employer, computer skills (i.e. none as reference group, basic, moderate, and complex), study abroad, and ethnicity (i.e. Bumiputera as reference group, Chinese, Indian, and others).

7.4.3 Employer-level variables

Firm performance is based on two variables: firm productivity (i.e. log of value-added per worker) and firm profitability (i.e. log of profit per worker). Firm input variables are logs of employment, capital, and capital-labour ratio, as well as share of skilled workers, female workers, foreign workers, and workers with a higher level of education. We also controlled for industry fixed-effects at the second stage of analysis with nine industry dummies. These are based on the 4-digit ISIC for manufacturing firms, i.e. textiles, garments, chemicals, rubber and plastics, machinery and equipment, electrical appliances, electronics, auto parts, wood and furniture (with food processing as reference group).

7.5 Empirical methods

In this section, we consider the model of the Malaysian pay equation by using cross-sectional matched employer-employee data. The aim of this chapter is to examine the role of employee characteristics (e.g. education) and firm characteristics (e.g. firm performance, firm size) in determining the pay structure in the Malaysian economy. Even though the matched data enabled us to estimate the statistical firm effect, we cannot separately distinguish the part of this effect that is due to unobservable employee heterogeneity versus unobservable employer heterogeneity with cross-sectional data. We therefore apply the two-stage estimation strategy proposed by Abowd, Kramarz, and Margolis (2001).

The first stage is to examine a linear structure for pay in which the logarithm of monthly pay is explained by the measured employee characteristics and the firm effect. Although with this dataset we are able to estimate the firm effect, we cannot identify the part of this effect that is caused by the unobservable worker or firm heterogeneity. The second stage is to relate the estimated effect of measured worker characteristics and estimated firm effect on pay to firm performance (i.e. logarithm of value added per worker) and firm-size (i.e. log of employment).

7.5.1 The linear pay model with firm-specific fixed-effects

We start with a pay equation in which workers' pay depends both on employee characteristic (level of education) and employer characteristics (performance and firm size), as follows:

$$\ln Pay_{ij} = \beta_1 X_{ij} + \beta_2 F_j + \varepsilon_{ij} \qquad \textbf{7.1}$$

where $ln\,Pay_{ij}$ is the log of the monthly pay of worker *i* working at firm *j*, X_{ij} is the observable characteristic of worker *i* (years of schooling), F_j is a vector of observable characteristics of firm *j* (performance and size), ε_{ij} is the disturbance term, and *i* = 1,…,*N*; *j* = 1,…,*J*.

Least squares estimates β_1 and β_2 from equation 7.1 might be biased due to the problem of endogeneity. This problem may have arisen for two reasons. Firstly, equation 7.1 contains only controls for the observable effects of workers and firms. It does not take into account worker and firm unobserved heterogeneity. The absence of controls for unobserved time-invariant employee and employer effects would have caused the omitted variable bias. For example, an omitted ability in pay equation is where an individual's years of schooling are likely to be correlated with unobserved ability. In addition, although the effects of firm performance on pay can be interpreted as rents, they may also be a result of unobserved employee and/or employer characteristics. For example, high-ability workers might be systematically sorted into high-performance firms. To control the potential omitted variable bias, we add worker and firm fixed effects into the pay equation.

Secondly, simultaneity arises when firm performance and firm size are determined simultaneously along with pay. For example, based on the efficiency wage models, high wages can induce high productivity or profits, and high productivity or profits can provide high wages. There is an accounting relation from wages to profits; by definition, higher wages reduce profits. This bias has a negative effect on profit estimate. We consider this problem by examining the effects of firm performance and size and other firms' inputs on wages according to the two-stage procedure described below.

Using matched firm-worker data and methods of Abowd, Kramarz, and Margolis (1999), we were able to quantify worker and firm fixed effects as well as estimate these effects simultaneously within the same regression. In order to include worker and firm fixed effects in the pay equation so as to obtain a fully specified regression model, we propose modifying equation 7.1 as follows:

$$\ln Pay_{ij} = \beta_1 X_{ij} + \theta_{ij} + \psi_{J(i)} + \upsilon_{ij}, \qquad \textbf{7.2}$$

where θ_{ij} is a person-effect representing unobservable worker heterogeneity, $\psi_{J(i)}$ is a firm-effect representing unobservable firm heterogeneity, υ_{ij} is the disturbance term, and the rest of the variable and parameter symbols are defined as in equation 7.1. The specification model for equation 7.2 now contains both observed and unobserved worker and firm effects. Since only in one year (i.e. 2006) can information on workers be matched with information on their employing firms, we cannot directly estimate the effects θ_{ij} and $\psi_{J(i)}$. Instead, we estimate a single unrestricted firm effect for each firm *j*, which may be interpreted as $\delta_{J(i)} \equiv \theta_{ij} + \psi_{J(i)}$,

where $\delta_{J(i)}$ is the estimated firm effect that consists of a combination of the average individual worker effect within the firm and the true firm effect. Thus, the individual worker's pay using worker-level data is represented by the following equation:

$$ln\, Pay_{ij} = \beta_1 X_{ij} + \delta_{J(i)} + \upsilon_{1ij}. \qquad \textbf{7.3}$$

In the first stage, we estimate equation 7.3 at the employee-level using the least-squares estimator. We do not have panel data that would allow us to control for a person's unobserved fixed effects; however, we expect that by including information on formal education level, occupation, and other human capital variables, we might be able to mitigate this problem.

7.5.2 Analysis of firm heterogeneity

In the second stage, we use the firm-level data to analyse the firm characteristics, as listed in Section 7.4.3. In order to explain the firm-specific fixed-effects (i.e., the firm-specific compensation policies), we perform regression of these firm-specific effects on firm-level variables as follows:

$$\hat{\delta}_j = c + \alpha F_j + e_j \qquad j = 752 \qquad \textbf{7.4}$$

Where $\hat{\delta}_j$ is the estimated firm-specific fixed-effects obtained from the first stage estimation, F_j is the vector of observable employer (i.e., firm) characteristics, and e_j is the disturbance term. We estimate equation 7.4 by using OLS estimator.

7.5.3 An estimation of the relations between pay structure and firms' performance and input

Pay structure comprises two components, namely, the average firm-specific effects in the pay equation and the average predicted pay in the firm. Therefore, apart from the estimated firm-specific effects ($\hat{\delta}_j$), we also calculate the average predicted pay in the firm, taking into account the individual characteristics of employees. We denote this average by $\hat{\beta}_1 \overline{X}_j$. In order to estimate the relation between the estimated components of pay and firms' performance as well as firms' input, we conduct another firm-level analysis as follows:

$$Q_j = \mu_0 + \mu_1(\hat{\beta}_1 \overline{X}_j) + \mu_2 \delta_J + \varphi_j + v_j \qquad \textbf{7.5}$$

where Q_j represents each firm's performance and inputs variables as listed in Section 7.4.3; μ_0, μ_1 and μ_2 are the parameters to be estimated; φ_j is a fixed industry effect; and v_j is the disturbance term. The result from this equation explains the relation of pay components to firm characteristics. From these results, we can examine the relation between pay structure and firm performance on the one hand, and pay structure and firm inputs on the other.

7.6 Empirical results

In this section, we first present the estimation results of the first stage of our analysis, namely the pay estimation including firm-specific fixed-effects at the employer-level. Next, we present the results of the second-stage analysis, namely the impact of firm characteristics on firm-specific pay policies. Finally, we present the relation between the pay structure and firm performance on the one hand, and pay structure and firm inputs on the other.

7.6.1 The relative importance of observable characteristics and firm-specific effects

Table 7.1 shows the result for pay estimation from equation 7.3. The result from this equation explains the impact of observable worker characteristics including the firm-specific effects on the monthly pay of Malaysian manufacturing workers in 2006. Most of the worker characteristics have a significant impact on pay except for tenure squared, training at the previous employer, studying abroad, and other ethnicity dummies. The R-square value of this model is 0.577, meaning that about 58 percent of the variability in the pay determination of workers is explained by regression on worker characteristics and firm-effects.

Based on Table 7.1, the result on education indicates that an additional year of schooling is associated with a 1.5 percent increase in monthly pay (holding all other independent variables constant). In addition, the results on experience and job tenure indicate that one additional year of experience and job tenure raises pay by 1.1 and 0.9 percent respectively, holding other factors constant. The results also imply that experience has a diminishing effect on pay.

As expected, distance has a positive and significant effect on the worker's monthly pay. This means that the farther the distance from the workplace, the greater the pay that the worker gets. A coefficient of 0.02 indicates that the impact of distance on pay is somewhat smaller, where a one-percent increase in the distance from the workplace causes pay to increase by only 0.02 percent.

The results also suggested that workers with a higher educational level earn more compared to those with a lower educational level. Based on Table 7.1, we can see that workers who hold a university degree get a 12-percent higher pay than the diploma holder. Meanwhile, workers who have completed upper secondary, lower secondary, and primary education receive respectively, 14, 15, and 18 percent less pay compared to the diploma holder.

In the case of training and skills, the results in Table 7.1 show that training from the current firm is statistically significant and has a positive sign, while training from a previous firm is insignificant when it comes to determining the worker's pay. Workers who received training from their current employer get better pay than those who had not received such training. Based on the results, workers who received training from their current employer receive a five-percent higher pay than those who had not received such training. Moreover, we can see from Table 7.1 that workers who have computer skills get more pay than those who do not have any computer skills. Compared to those with no computer skills, having basic computer skills raises the pay by eight percent, while workers with moderate computer skills receive on average a higher pay by 12 percent. Workers with complex computer skills have a 14-percent higher pay.

As far as occupation is concerned, Table 7.1 indicates that all types of occupation that have been included are statistically and highly significant with the expected signs. Managers and professionals (such as engineers, accountants, lawyers, chemists, scientist, and software programmers.) receive respectively 29 and 28 percent higher wages than unskilled production workers. Meanwhile, skilled workers (such as technicians, and supervisors.) and non-production workers (such as administrative and sales workers) receive respectively 13 and 8 percent higher wages than unskilled production workers. Turning to demographic factors, gender, marital status, and ethnicity are statistically significant. Based on results in Table 7.1, we found that females earn 15 percent less than males, married people earn five percent more than singles, and Chinese and Indians seem to have better pay than Malays.

To sum up, the results from the first stage analysis imply that both observable worker characteristics and unobserved firm-specific effects play an important role in pay determination in Malaysia. However, the impact of firm-specific fixed-effects (with a coefficient of 1.028) on pay is greater than the impact of observable worker characteristics such as education (with a coefficient of 0.015) and experience (with a coefficient of 0.011) on pay.

Table 7-1: Least Squares Estimates of the Determinants of Monthly Pay, Including Firm Fixed-Effects

Explanatory Variables	Coefficient	Robust S.E
Education	0.0150***	0.0045
Experience	0.0110***	0.0012
Experience^2	-0.0004***	0.0012
Tenure	0.0098***	0.0022
Tenure^2	0.0001	0.0001
Log of distance	0.0245**	0.0086
University degree	0.1180***	0.0338
Upper secondary	-0.1380***	0.0262
Lower secondary	-0.1470***	0.0352
Primary school	-0.1780***	0.0499
Female	-0.1510***	0.0170
Married	0.0493**	0.0175
Management	0.2870***	0.0371
Professional	0.2760***	0.0389
Skilled production	0.1300***	0.0255
Non-production	0.0759**	0.0281
Current training	0.0532*	0.0237
Previous training	0.0173	0.0219
Basic comp. skill	0.0839*	0.0224
Moderate comp. skill	0.1270***	0.0244
Complex comp. skill	0.1480**	0.0398
Study abroad	0.0942	0.0597
Chinese	0.1850***	0.0227
Indian	0.0655*	0.0268
Others	0.1370	0.0942
Firm fixed-effects	1.0284***	0.0050
Constant	6.4727	0.0449
No. of observations	7059	
R-squared	0.577	
Adjusted R-squared	0.525	
Rmse	0.470	

Notes: The dependent variable is the log of monthly pay in Ringgit Malaysia (RM). All included variables are shown in the table. A constant is included in regression. Significance at the 1 percent, 5 percent, and 10 percent level is indicated by ***, ** and *, respectively.

Table 7-2: Correlation among the components of workers' pay

	Log Monthly Pay	Firm-effects	Worker characteristics	Residual
Log Monthly Pay	1.0000			
Firm-effects	0.6272	1.0000		
Worker characteristics	0.5473	0.2042	1.0000	
Residual	0.6505	-0.0000	-0.0000	1.0000

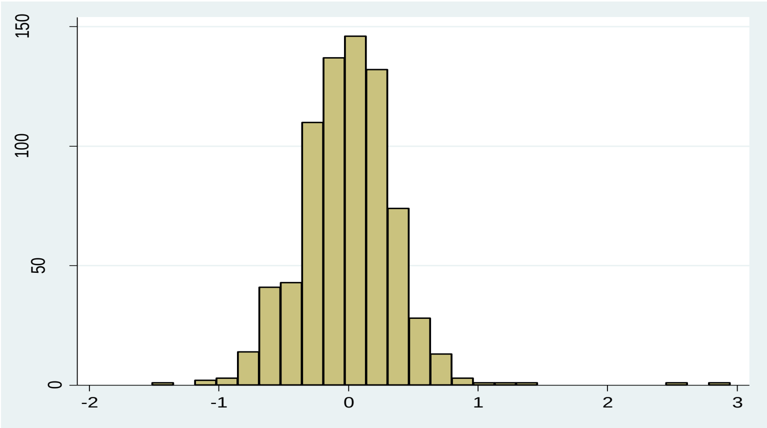
Source: *Author's calculations based on the regression in Table 7.1.*

Table 7.2 shows the correlations for the components of the workers' pay. The components of pay are divided into observable worker characteristics, unobservable firm-effects, and residual. From the table, one can see that the correlation between unobserved firm-effects and log of real monthly pay is greater than the correlation between observable worker characteristics and log of monthly pay. This implies that in the case of Malaysia, unobserved firm-effects are important in explaining the variation in log pay.

7.6.2 The impact of firm characteristics on firm-specific pay policies

In the previous sub-section, we have introduced a firm-specific fixed-effect for each firm. These specific fixed-effects represent a base level of pay; hence, they are an important feature of firm-specific pay policies. As shown in Table 7.1, firm-effect variable is statistically significant at the 1 percent level. This indicates that the role of firm-specific fixed-effects is crucial towards determining the worker's pay in Malaysia. Moreover, Figure 7.2 has reported that the values of firm-specific fixed-effects lie between -1.516 and 2.948, with an average value of -0.005.

Figure 7.2: The estimated firm- specific fixed-effects



Obs.	Mean	Std. Dev.	Min	Max
752	-.005	.369	-1.516	2.948

By using the above figures, we have calculated the average pay, highest pay, and lowest pay as follows:

(1) Average pay = -0.005 + 6.98 = 6.972 = RM 1066.35 per month[73].

(2) Highest pay = 2.948 + 6.98 = 9.925 = RM 20434.91 per month[74].

(3) Lowest pay = -1.516 + 6.98 = 5.461 = RM 235.00 per month[75].

Based on the above figures, we found that the highest pay is around 19 times higher than the average pay, while the lowest is about five times lower than the average pay.

Consequently, this sub-section focuses on firm-specific effects so as to explain their values from the firm-level variables. In order to explain such fixed effects, we perform regression on these fixed-effects for the firm-level characteristics' variables. The results are shown in Table 7.2.

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[73] 6.98 = mean of log real monthly pay (refer to Table A7-2). Exp (6.972) = 1066.35.
[74] exp(9.925) = 20434.91.
[75] exp(5.461) = 235.00.

Table 7-3: Regression of firm-specific fixed-effects on firm-level variables in 2006

The dependent variable: Estimated firm-specific fixed-effects	
Firm Characteristics	**Coefficients**
Log employment	0.0472***
Log value-added per worker	0.0471***
% of female workers	-0.0020***
% of higher education workers	0.0019**
% of foreign workers	-0.0024***
Foreign owned	0.0486*
Single shift	-0.0630*
Double shift	-0.0585*
North	-0.1890***
South	-0.0753**
East Coast	-0.3770***
Sabah	-0.2880***
Sarawak	-0.3760***
Constant	-0.5000***
No. of observations	752 firms
R-squared	0.27

Notes: All included variables are shown in the table. Pure domestically owned, triple work shift and Central region as a reference group for their own categorical variables. ***, **, and * denotes statistically significance at 1%,5%, and 10% respectively.

Based on Table 7.3, we found that firm size[76] has a positive impact on firm-specific fixed-effects, as expected. A coefficient of 0.047 indicates that when a firm is hiring one percent more worker, the average firm-specific effects ($\hat{\delta}_{j(average)}$) would increases by 0.047. The increase(s) of ($\hat{\delta}_{j(average)}$), in turn, would lead to increases in changes to the average firm-specific effects ($\Delta\hat{\delta}_{j(average)}$) by 0.0422 (i.e. -0.005 + 0.0472). As a result, the average pay[77] will increase from RM1,066.35 to RM1,121.25. Based on these figures, one can also conclude that the average pay would increase about RM 54.00 as a firm hires one percent more worker.

[76] The firm size is proxied by the log of employment.
[77] Average Pay = 0.0422 + 6.98 = 7.0222 (antilog = RM 1,121.25).

Table 7.3 also shows that the log of value added per worker is statistically significant at the one percent level and has a positive sign. The coefficient of 0.0471 implies that when a firm increases its productivity by one percent, the average firm-specific effects ($\hat{\delta}_{j(average)}$) would also increase by 0.0471. Then, such an increase would cause changes in the average firm-specific effects ($\Delta\hat{\delta}_{j(average)}$) to reach 0.0421. Accordingly, the average pay[78] will increase from RM1,066.35 to RM1,121.14. In other words, the average pay would increase about RM 54.00 as a firm raises its productivity by one percent.

In addition, the firm's share of higher education workers also has a positive impact on firm-specific fixed-effects. A coefficient of 0.002 indicates that a one-percent increase in a firm's share of higher education workers (holding all other factors constant) would correspond to an increase in the average firm-specific effects ($\hat{\delta}_{j(average)}$) by 0.002. Such increases would then cause changes in the average firm-specific effects ($\Delta\hat{\delta}_{j(average)}$) to increase from -0.005 to -0.003. Accordingly, the average pay will increase from RM1, 066.35 to RM1, 068.49. Based on figures calculated above, we can also say that the average pay would increase by around 0.2 percent when a firm raises its share of educated workers by one percent.

In contrast, the share of female as well as foreign workers has a significant and negative impact on firm-specific fixed-effects. A coefficient of -0.002 for both factors implies that a one-percent increase in a firm's share of female workers (or share of

[78] Average Pay = 0.0421 + 6.98 =7.0221 (antilog = RM 1,121.14).

foreign workers), holding all other factors constant, would lead to decreases in the average firm-specific effects ($\hat{\delta}_{j(average)}$) from -0.005 to -0.007. As a consequence, the average pay will decrease from RM1, 066.35 to RM1, 064.22 for both factors. Based on the figures calculated above, we can also say that the average pay would decline by 0.2 percent when a firm's share of female workers (or share of foreign workers) increases by one percent.

In terms of firm ownership, Table 7.3 indicates that foreign-owned firms tend to be statistically significant at the one-percent level and have a positive sign. A coefficient of 0.049 implies that the average firm-specific effects ($\hat{\delta}_{j(average)}$) for foreign-owned firms are higher than domestically-owned firms by 0.05. As a result, the average pay for foreign-owned firms is higher compared to domestically-owned firms.

Turning to the work shifts, Table 7.3 shows that single and double work shifts dummies are statistically significant at the 10-percent level and have a negative sign. This implies that the average firm-specific effects ($\hat{\delta}_{j(average)}$) for firms that operate with single and double work shifts are lower than for firms that operate with triple work shifts. As a consequence, the average pay for firms with single and double work shifts is lower than that for firms with triple work shifts.

As far as geographical variation is concerned, Table 7.3 shows that all regional dummies have an important impact on firm-specific fixed-effects. The negative signs envisage that the average firm-specific effects ($\hat{\delta}_{j(average)}$) for firms located in the North, South, East Coast, Sabah, and Sarawak are lower than those for firms located in the Central region. In this manner, the average wages paid by firms that operate in the Central region are higher than those paid by firms operating in the other regions.

7.6.3 The relation of pay components to firm performance and inputs

Table 7.4 shows the results of relating the pay components (i.e. average firm-specific effect and average predicted pay) of each firm to firm performance with equation 7.5 using OLS. In this context, firm-specific effects are a measure of firm-specific pay policies, so these firm-effects represent the base level of pay in each firm. This table also shows the relation between the estimated components of pay and a firm's input such as the logs of employment, capital, and capital labour ratio, as well as share of skilled workers, female workers, foreign workers, and workers with a university level of education.

Table 7-4: Estimated relations between pay structure and firm's performance and input

Independent variables Dependent variables	Average firm-specific effects in pay equation		Average predicted pay in firm	
	Coeff.	Std. Err.	Coeff.	Std. Err
Log value-added per worker	0.6720***	0.1326	0.3574***	0.0832
Log profit per worker	0.8512***	0.1181	0.4640***	0.0799
Log of employment	0.6726***	0.1646	0.4134***	0.0863
Log of capital	1.4667***	0.2934	0.8421***	0.1544
Log of capital labour-ratio	0.7940***	0.2053	0.4287***	0.1316
Most skilled workers	5.0036	3.1567	6.7657***	2.0805
Most female workers	-8.3616***	2.2935	-6.0079***	1.7262
Most foreign workers	-4.1453*	2.4127	3.0202	1.9143
Most higher educated workers	6.97357***	1.5534	6.3085***	1.1455

Source: Author's calculations based on the results in Tables 7.1 and 7.2. Significance at 1 percent and 10 percent level is indicated by *** and *, respectively.

From Table 7.4, we observed that firms with a high average base level of pay also employ more productive workers and reap higher profits. In terms of the average predicted pay, firms employing workers with a high average predicted pay employ more productive workers and also have higher profitability. On the one hand, we found firms that are higher in both components of pay (average predicted pay and average base-level of pay) tend to be large, capital-intensive, have an abundance of skilled-workers, and also an abundance of workers with a higher level of education. On the other hand, a firm that is lower in both components of pay tends to be one with an abundance of female workers.

7.7 Discussion and conclusion

This chapter is an attempt to respond to the shortcomings of the available empirical studies by utilising the rich and unique MWFD for the Malaysian manufacturing sector in 2006. In the first stage of analysis, we found that observable worker characteristics and unobserved firm-effect both play an important role in the Malaysian pay determination. The correlation between unobserved firm-specific effects and log pay is greater than that between observable worker characteristics and log monthly pay. Moreover, firm-specific effects are different across firms, which suggests that employers have some market power in the Malaysian economy.

In the second stage, we can conclude that firms which are large, productive, and have an abundance of educated workers pay higher average wages to their workers compared to the industrial average. On the other hand, firms that have an abundance of both female and foreign workers pay lower average wages to their workers compared to the industrial average. In addition, foreign firms pay higher average wages compared to local firms. And firms that are located in the central region pay higher average wages to their workers compared to firms that are located in the other regions of Malaysia.

Consequently, we found that higher paid workers, either because of worker characteristics or firm-specific effects, are employed in firms that are more productive and profitable. The relation between firm-specific effects and profitability can be either positive or negative depending on either the efficiency wage effect or the rent-sharing effect that dominates. This result implies that Malaysian pay policies are dominated by the efficiency wage effect. To have more thorough and direct interpretations of our results, the production function ought to be specified, which would be a task for future research.

Annex Chapter 7

Table 7-5: Summary Statistics for the Pay Estimation Including Firm Specific Effects, at the Employee-Level Dataset

Variable	Mean	SD
Log real monthly pay	6.98	0.68
Education	10.95	3.29
Potential experience (centered)	-0.21	11.24
Potential experience squared (centered)	126.27	181.39
Tenure (centered)	0.11	7.23
Log of distance	2.05	1.05
University degree level of education	0.09	0.29
Upper secondary level of education	0.40	0.49
Lower secondary level of education	0.24	0.43
Primary school	0.13	0.33
Female	0.49	0.50
Married	0.66	0.48
Management	0.15	0.36
Professionals	0.08	0.28
Skilled production workers	0.36	0.48
Non-production workers	0.19	0.39
Training at current firm	0.41	0.49
Basic computer skills	0.22	0.41
Moderate computer skills	0.40	0.49
Complex computer skills	0.06	0.25
Study abroad	0.03	0.17
Chinese	0.37	0.48
Indian	0.09	0.28
Other ethnics	0.01	0.09

CHAPTER 8 : GENERAL CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

From the outset, this thesis set out to explore pay determinants in the Malaysian economy from three different perspectives (viz. employees' perspective, employers' perspective, and both employees-employers' perspectives) using the Malaysian WLD, FLD, and MWFD. In this final chapter, the discussion takes the following approach. Section 8.2 summarises and synthesises the empirical findings across the empirical chapters. Section 8.3 then outlines a number of implications for matters of policy. Section 8.4 discusses the thesis' limitations, offers suggestions for future research, and then draws the thesis to a conclusion.

8.2 Empirical findings

The main empirical findings are chapter-specific and were summarized within the respective empirical chapters in this way: Chapter 5: The impact of worker characteristics on individual worker's pay in the Malaysian economy; Chapter 6: The effects of employers' characteristics on the average firm-level pay rates; Chapter 7: The role of employer-employee specific-effects in determining the individual worker's pay. The analysis in Chapter 5 utilizes WLD, while the analysis in Chapter 6 uses FLD, and with the availability of WLD (which can be linked to FLD) it has made the analysis in Chapter 7 feasible. This section will summarise and synthesize the empirical findings in these three chapters but with a view to addressing this study's research questions.

8.2.1 Impact of employees' characteristics on individual worker's pay at the WLD

The aim of Chapter 5 is to identify the determinants of the individual worker's pay in the Malaysian manufacturing sector. By utilizing the Malaysian WLD, this chapter addresses the first research question, namely: what is the key determinant(s) of the individual worker's pay in Malaysian manufacturing? In addition, this chapter also examines how the individual worker's pay is affected by worker characteristics such as training, skills, occupation, location, and the extent to which these variables have managed to explain pay variation as outlined in the second and third research questions.

The pay models are based on the framework of Mincer's (1974) human capital earnings function. The empirical work focused on estimating the impact of employee characteristics (comprising six vectors of worker characteristics) on the individual worker's pay (i.e. log of monthly pay in RM) in the Malaysian manufacturing sector for the year 2006.[79] Chapter 5 sets out the results. Instead of including only the vectors of basic human capital (i.e. years of schooling, potential experience and its squared, and tenure and its squared), in the basic pay model we incorporated the vector of sheepskin effects (i.e. dummies for the highest level of education attained). In the augmented pay model 1, we included a vector of demographic factors such as gender, marital status, citizenship, and ethnicity. Meanwhile, in the augmented pay model 2, we included training and skills (i.e. training with current and previous employer,

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[79] We included these six vectors: (1) basic human capital; (2) sheepskin effects; (3) training and skills; (4) demographic; (5) kinds of work; and (6) state of residence, step by step, in model 1 to model 6.

computer skills, people skills, off-the-job training, studied abroad), occupations (viz. manager, professionals, skilled workers, and non-production workers), distance from the workplace, and location. The statistical results seem to have improved as one moves from the basic model to the augmented pay model 2.[80]

In general, all factors in our models were considered to be important determinants of pay in the Malaysian manufacturing sector.[81] In all of them, the key determinant of the worker's pay is the 'sheepskin effects' or worker's qualification. Workers with higher educational qualification receive a significantly higher pay than those with lower qualification. This finding supports the prediction of the screening theory which argued that workers with diploma(s) will earn more than their counterparts, even those with the same years of schooling but who do not possess any diploma (Belman and Heywood, 1991; and Card and Krueger, 1992). The inclusion of the 'sheepskin effects' in our study has made it possible to estimate the true effects, unlike previous studies that neglected this factor. Moreover, Jaeger and Page (1996) stress that studies that depend solely on the continuous measure of completed schooling tend to be biased. In comparison by gender, the pay premium for university degree and college diploma tends to be higher for females than males. These results confirm the findings by Latifah (1998) that the incremental effects of successive levels of formal education are higher for females than for their male counterparts.

The findings also reveal that training and skills positively affect the worker's pay. Workers who have had training also receive a higher pay than those without training.

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[80] R^2 increased from 0.28 to 0.55 and the estimated standard error became smaller.
[81] See details in Chapter 5.

Interestingly, training from current employer has a bigger impact on pay than training from a previous employer. Moreover, workers who have a vocational certificate (proxy for off-the-job training) earn a higher pay than those who have not. Among the skills, having complex computer skill has a more positive effect on pay compared to medium, basic or no computer skills, as well as skills in dealing with people. This finding has support in the argument by Krueger (1993) that workers who use a computer in their job earn higher wages. In addition, workers who have studied abroad also receive a higher pay than workers who have not. This is because studying abroad contributes to language skills, knowledge, and attitudes which also influence labour market outcomes (Miller, 1995; Palifka, 2003). Not surprisingly, the findings also highlight that workers in professional employment and management (and also have higher skills) are paid significantly higher salaries than those in other types of jobs.

In the 10th Malaysian Plan 2010-2015, the Government of Malaysia emphasized the mainstreaming of vocational education in order to transform Malaysia into a high-income developed nation by 2020. To achieve this vision, Malaysia needs more skilled and semi-skilled workers to also become knowledge workers (k-workers). The 9th Malaysian Plan 2006-2010, shows that only 28 percent of the Malaysian population can be considered highly skilled workers. To meet these emerging skill requirements for k-workers, vocational education needs to be transformed so as to be able to equip trainees with the requisite skills. This highlights the importance of human capital variables in determining the individual worker’s earning power.

Finally, this study found that distance and location also affected the worker’s pay in a positive manner. In this respect, those who live far from their workplace as well as those who reside in developed states (e.g. Kuala Lumpur, Selangor, Johor, and Melaka) earn a relatively higher pay. I also think that a lack of job opportunities with higher paid income is one possible reason for the pay differential by location in Malaysia.

The results from the augmented Mincerian pay model 2 regression (which includes training, skills, occupations, distance, and location) suggested that these new variables have significant explanatory power in determining the individual worker's pay compared to the augmented Mincerian pay model 1 (which excludes these same variables). Nevertheless, this empirical analysis has several limitations. First, by using WLD we only consider the supply-side factors from the employee's perspective in determining the individual workers' pay, but without taking into consideration the demand-side factors from the employer's perspective. For example, we focused particularly on the effects of the employees' characteristics while the effects of the employer's characteristics (which might well explain the worker's pay) were for all intents and purposes neglected. Second, no ability-variable was taken into account. We would argue that our sample is rather homogeneous in terms of ability, and the estimated true effect is less likely to be upward biased because of the omission of ability.

8.2.2 Impact of employers' characteristics on the average firm-level pay rates using FLD

The second empirical study in this thesis examines the determinants of average wage rates at the firm-level. In this analysis, we only focus on the employer's perspectives on pay determination in the Malaysian manufacturing sector. Chapter 6 addresses the fourth research question, namely: what are the important determinants of the average firm-level pay rates in Malaysia? Here, there is particular focus on the employer's characteristics. Consequently, this chapter also examines the effects of the employer's characteristics on the worker's pay as outlined in the fifth research question. Employer characteristics comprise employer size, employer performance, capital, regional variation, openness, and governance. In addition, this chapter also addresses the 6th research question, namely: can the Malaysian labour market be characterized as an imperfect labour market, i.e. monopsony?

Chapter 6 sets forth the results of our efforts[82]. Employer characteristics such as employer size, firm's human capital stock, firm's performance (i.e. productivity and profitability), ownership, and regional variation are found to be important factors for determining the average monthly pay in Malaysian manufacturing, whereas factors such as openness (i.e. exporter), governance (i.e. legal status), and industry concentration are found to be insignificant.

Based on the aforementioned results, employer size plays an important role in determining the average pay, as suggested by previous studies such as Idson and Oi (1999), and Soderbom and Teal (2004). From the results based on dummies of employer size, large firms pay their workers about eleven percent more than small firms, while medium firms pay their workers around two percent more than small firms. Consequently, results based on continuous firm size variable (employment)

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[82] For details, see Table 6.2 in Chapter 6.

seem to suggest that a one-percent increase in employer size leads to a two-percent increase in average pay, even after controlling for workplace characteristics that affect productivity.

Furthermore, the firm's human capital such as its share of skilled and higher education workers positively affects its workers' average monthly pay. In contrast, its share of female and foreign workers negatively affects its workers' average monthly pay. Moreover, the firm's performance such as profitability and productivity also played an important role in determining the worker's average pay. In addition, foreign-owned firms and regional variations have a positive and significant impact on the average monthly pay.

To sum up, we found some evidence that the Malaysian pay structure is under imperfect competition, where employers have market power (as in setting wages) in the Malaysian manufacturing sector. According to Manning (2003a), in an imperfect competition, the supply labour curve facing the firm is not infinitely elastic but is upward sloping in relation to the average worker's pay. In this respect, an employer may set wages below the marginal revenue product if there is no competition in the labour market. The more inelastic the labour supply, the larger will the gap be between the achievable wage rate and the marginal revenue product. This may be indicative of a monopsonistic market structure where firms with bigger market share also have a higher mark-up on pay.

In other words, the proposed model fits the data well, as the F-statistics are highly significant at all conventional levels. However, this study only uses a cross-sectional data on employers. Such data is very useful for estimating the Malaysian pay structure by matching the relevant employers with their employees' data. By using this type of data, we can match more detailed variables on the demographic characteristics of workers with relevant information about the firm in which they currently work. Moreover, such matched data will enable us to control for firm effects.

8.2.3 The impact of observable worker characteristics and firm-specific effects on the worker's pay

Based on the datasets on worker-level and firm-level in Chapters 5 and 6, Chapter 7 of this thesis further analyses the role of employer-employee specific effects in determining the worker's pay in Malaysia using the Malaysian MWFD from one common year (i.e. 2006). The MWFD enables us to put together the two sides of the labour market, i.e. supply and demand, towards examining pay determination. This analysis has focused on examining how the worker's pay is affected by the employee-employer specific effects in the Malaysian manufacturing sector – as stated in the seventh research question. In addition, this chapter also provides a comparative analysis between observable worker characteristics and unobservable employer characteristics with a view to ascertaining the dominant one in determining the worker's pay – as outlined in the 9th research question. Furthermore, this chapter also addresses the 10th research question, namely: what are the relations between pay structure on the one hand and firm's performance and inputs on the other?

Using this matched data, we are then able to estimate the statistical firm effect, but since we only have data for one year, we cannot disentangle part of this effect that is due to unobservable employee or employer heterogeneity. And so, we adapted the two-stage estimation strategy proposed by Abowd, Kramarz, and Morgalis (2000) in order to control for any potential simultaneity bias.

Chapter 7 sets out the results. In the first stage of the analysis, we examine a simple linear structure of pay in which the logarithm of monthly pay is explained by the measured employee characteristics and firm fixed-effect. At this stage, we found that observable worker characteristics and unobservable firm specific fixed-effect both play an important role in the determination of pay in Malaysia[83]. The correlation between unobserved firm specific fixed-effect and the log of monthly pay is greater than that between observable worker characteristics and the log of monthly pay, as shown in Table 7.3 of Chapter 7.

The second stage is to relate the estimated effects of measured worker characteristics plus the estimated firm specific fixed-effect on pay to firm performance (i.e. the log of value added per worker) and firm size (i.e. the log of total employment). At this stage, we also estimate the firm specific fixed-effect on employer and employee characteristics, wherein we found that higher paid workers, either because of worker characteristics or firm fixed-effects, tend to be employed in firms that are more productive and profitable. The relation between firm fixed-effect and profitability can either be positive or negative depending on either the efficiency wage effect or the dominant rent-sharing effect. This result implies that the Malaysian pay policies are

[83] Refer to Table 7.2, Chapter 7.

dominated by the efficiency wage effect in accordance with the Productivity-Linked Wage System (PLWS).

From an empirical perspective, the studies conducted in the thesis have shown that pay rates determination are complex since pay rates are determined by the characteristics of both workers and their employers. As long as workers' and firm's characteristics are uncorrelated, we may still end up with unbiased estimates as to the impact of workers' (or firm's) characteristics on worker's pay. This means that both types of characteristics have separate yet significant impacts on the worker's pay. In reality, however, employee and employer characteristics are correlated in determining pay rates, and this has been captured by the firm-specific fixed-effects. Such firm-specific fixed-effects can only be estimated when employees' data are matched with those of their employer. The use of an employer-employee matched dataset should also make the analysis more robust if claims made by its proponents are true. The empirical literature utilizing a matched dataset is highly concentrated on developed countries and relies mainly on population surveys that provide little information on employer or firm characteristics. There is thus a greater need for studies that focus more on developing countries, which is exactly why this thesis, in having utilized employer-employee matched datasets from Malaysia (a middle-income economy), can fill such a gap.

8.3 Policy recommendations

The findings of this thesis offer useful insights in terms of policy implications for policy makers in Malaysia and elsewhere. Based on the results of empirical analyses presented in the previous chapters, this study has found that both employee and employer characteristics play a pivotal role in determining pay in the Malaysian manufacturing sector. Therefore, both characteristics should be of concern to employees, employers, as well as government. This section presents a few suggestions as how to improve the workers' pay in Malaysia.

8.3.1 Strengthen the quality of the Malaysian labour force

This thesis has emphasized worker characteristics, particularly the level of educational attainment, as the key determinants with a positive impact on the worker's pay. The median monthly pay for those with tertiary education is found to be the highest compared to other educational qualifications. In 2010, 58 percent of the Malaysian labour force had only a secondary-level education, 13.2 percent had primary-level education, and 2.6 percent had no formal education at all (DOSM, 2012). This implies that in 2010 nearly three-quarters of the Malaysian labour force were low-skilled.

Thus, improving the quality of the labour force requires the participation of the Ministry of Higher Education (MOHE) and the Ministry of Education (MOE). The education system needs to be reformed so as to produce students with strong analytical and problem-solving capabilities, a good command of English, and effective social networking skills. Moreover, embedding soft skills elements in the curriculum at the school level is one possible solution. Including soft skills in the school curriculum will also allow students to learn the necessary skills early. Recognition of the need for soft skills in the education system, combined with a refinement of the examination-based education system, will go a long way to improving the quality of the workforce in terms of academic and non-academic skills, both of which are particularly important in the modern labour market.

8.3.2 Improve the employability skills among graduates and workers

Apart from education, this thesis has also emphasized that skills and training also have a significant and positive impact on the worker's pay. The Ninth Malaysian Plan (9MP) shows that only 28 percent of the Malaysian population can be considered highly skilled. In addition, the talent base of the Malaysian workforce has lagged behind the standard found in high-income economies. However, under the Economic Transformation Programme for becoming a high-income nation, the country needs an additional 1.3 million workers from the Technical Vocational Education and Training (TVET) sector (e.g. technicians and associate professionals) by the year 2020. For this to happen, the government and the private sector will need to create many jobs with reasonable pay that increases with work experience in the TVET sector and in many occupations.

8.3.3 Fostering industrial training programmes

Based on our findings, employees' productivity is one of the key factors for improving pay in Malaysia. In order to improve the employee's productivity, various steps should be taken to improve the existing training provided by both employers and government. For example, training should be given to employees at all levels and it should also be done consistently and on a regular basis throughout the employee's career. This is because, unlike other developed countries such as Japan, there is no constant and long-term training for Malaysian enterprises. In addition, the public and private sector should collaborate more often in organising training programmes that will benefit both parties in the end.

8.3.4 Enhance the productivity of small medium enterprises (SMEs)

Our findings also point to employer size as well as firm performance as having a significant and positive impact on the worker's pay. As a matter of fact, compared to its regional peers as well as those in more developed countries, Malaysia's SMEs are categorised by: (1) relatively low productivity; (2) lower business formation rates than in high-income countries; (3) concentration of output and employment in a relatively small number of firms; and (4) a high share of SMEs operating in the informal sector. Moreover, of the total business establishment in Malaysia, 99.2 percent are SMEs. SMEs contribute around 32 percent of Malaysia's GDP, 59 percent of its employment, and 19 percent of its exports (Southeast Asian Economic Outlook, 2013).

Accordingly, productivity enhancement among SMEs is thus critical for improving the workers' pay. Therefore, policies that encouraging greater innovation and technology, enhancing human capital and entrepreneurship development among SMEs, expanding market access for products produced by SMEs., should be created and fostered. In addition, efforts to improve demand for SME products should be made, while the presence as well as the role of supporting institutions, particularly in rural areas, should be promoted.

8.4 Limitations and suggestions for future research

The use of worker-level, firm-level as well as matched employer-employee datasets to perform a comprehensive study on pay determination is relatively new in the context of Malaysia. Despite the best endeavours by the author, there are some inevitable limitations to this work. First, even though we were able to estimate statistical firm effects in Chapter 7, we could not (yet) identify separately the part of this effect that is due to unobservable individual heterogeneity versus unobservable employer heterogeneity with our cross sectional clustered data.

Second, we still expect the presence of self-selection even within firms. Unfortunately, we do not have longitudinal or panel data that would allow us to control for individual unobserved effects. Nevertheless, we expect that by including information on formal educational level, occupation, and other details pertaining to the human capital variable, we may be able to mitigate this problem. In addition, datasets that include sectors other than manufacturing might provide interesting insights, especially if and when the results presented here can also be confirmed for the other industries.

This thesis has had to utilise three separate datasets from one common year (2006) to examine the pay determination and its structure in the Malaysian economy. Developing a new and dedicated dataset on this issue of pay would of course be too costly and even unrealistic. However, a number of improvements may be suggested.

First, all three datasets are cross sectional with limited work histories so that gauging changes over time is tricky if not impossible. A full-blown panel dataset with questions on employee or employer characteristics and labour market outcome whilst desirable may not be feasible. The best that one can appeal for is that the current survey be repeated so that the researcher has at his or her disposal a repeated cross sectional dataset.

The theoretical framework and empirical study in this thesis have here and there hinted at these suggestions for further research. Firstly, besides worker and firm heterogeneity, a third important dimension of wage formation is job title heterogeneity (Torres et al., 2012). By incorporating job title fixed effects into the pay regression, we can make better progress in determining the contribution of job title heterogeneity. And by properly accounting for job title heterogeneity, one should be able to provide refined estimates that are filtered from the effects of job title heterogeneity and firm fixed-effects. This should shed additional light on the current debate concerning the role of assortative matching, as measured through the association between worker- and firm-fixed effects.

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